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MINERAL RESOURCES
OF THE
UNITED STATES
1930

PART II—NONMETALS

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U. S. DEPARTMENT OF COMMERCE
ROY D. CHAPIN, Secretary
BUREAU OF MINES
SCOTT TURNER, Director

MINERAL RESOURCES
OF THE
UNITED STATES
1930

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PART II—NONMETALS

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FUEL BRIQUETS[1]

By W. H. Young and J. M. Corse

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PRODUCTION

In 1930, for the second time in the history of the industry, the production of fuel briquets exceeded 1,000,000 tons. According to reports courteously furnished the Bureau of Mines by the operators of briquetting plants, the total output in 1930 was 1,028,865 net tons, valued at $8,028,736. This represents a decrease of 15.1 per cent in tonnage and 15.6 per cent in value from 1929.

Although production declined in 1930 it was still well above the high level set in 1926, when demand was stimulated greatly by the anthracite strike. The fact that output remained high in 1930, at a time when supplies of anthracite and bituminous coal were ample, is a definite indication of growth and stability in the briquetting industry.

Fuel briquets produced in the United States, 1929 and 1930

	Production			Value		
	1929	1930	Decrease	1929	1930	Decrease
	Net tons	*Net tons*	*Per cent*			*Per cent*
Eastern States	324,967	300,609	7.5	$2,030,837	$1,817,791	10.5
Central States	788,160	641,171	18.6	6,409,755	5,214,376	18.6
Pacific Coast States	99,288	87,085	12.3	1,074,613	996,569	7.3
	1,212,415	1,028,865	15.1	9,515,205	8,028,736	15.6

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[1] Work on manuscript completed March, 1931.

In 1930 the Eastern States showed the smallest proportional decrease in production of briquets—the output was 300,609 tons, or 7.5 per cent less than in 1929. The Central States reported a decrease of 18.6 per cent from 1929, the record year. Production in the Pacific Coast States amounted to 87,085 tons, a decrease of 12.3 per cent from 1929.

In 1930 Wisconsin accounted for more than half the total output. Its three plants and the three plants active in Pennsylvania produced more than 67 per cent of the total tonnage of the country.

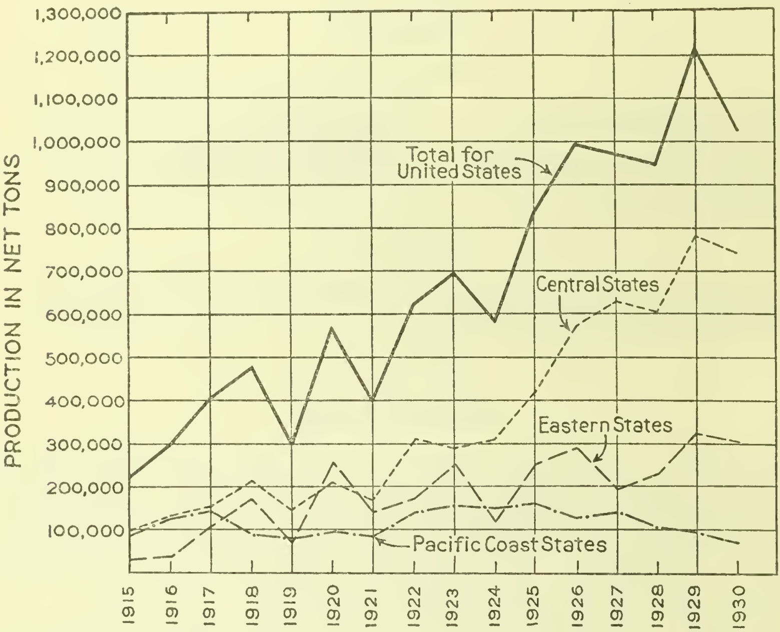

FIGURE 1.—Fuel briquets produced in the Eastern, Central, and Pacific Coast States and in the United States, 1915–1930

The expansion of the industry in recent years has been particularly notable in the Central States. For the country as a whole the production of briquets has more than doubled in the last ten years. During this period the use of briquets was stimulated by the anthracite shortages of 1922–23 and 1925–26. The curve in Figure 1 shows the trend of production during the last 16 years.

The progress of the industry since 1907, the date of the first statistical survey covering fuel briquets, is recorded in the following table.

Fuel briquets produced in the United States, 1907–1930[1]

Year	Net tons	Value	Year	Net tons	Value
1907	66,524	$258,426	1919	295,734	$2,301,054
1908	90,358	323,057	1920	567,192	4,623,831
1909	139,661	452,697	1921	398,949	3,632,301
1910	(2)	(2)	1922	619,425	5,444,926
1911	218,443	808,721	1923	696,810	5,898,698
1912	220,064	952,261	1924	580,470	4,986,622
1913	181,859	1,007,327	1925	839,370	7,128,404
1914	250,635	1,154,678	1926	995,332	8,533,179
1915	221,537	1,035,716	1927	970,468	7,985,165
1916	295,155	1,445,662	1928	947,423	7,705,617
1917	406,856	2,233,888	1929	1,212,415	9,515,205
1918	477,235	3,212,793	1930	1,028,865	8,028,736

[1] Figures for earlier years not available.

[2] No canvass for 1910.

MONTHLY PRODUCTION

The production of 175,503 tons of briquets in January, 1930, was the outstanding feature of the year, being only a few tons less than the previous record of 175,960 tons in December, 1929.

The seasonal character of househeating makes the production of briquets highly seasonal. Activity, therefore, is curtailed and at many plants discontinued during the early spring and summer. In 1930 April marked the lowest ebb of output; January, February, May, and the last three months of the year were the periods of greatest production.

Monthly production of fuel briquets in the United States, 1924–1930, in net tons

Month	1924	1925	1926	1927	1928	1929	1930
January	80,938	93,310	125,721	123,239	119,846	159,768	175,503
February	42,609	62,479	110,815	79,227	91,162	139,540	86,645
March	24,953	47,504	66,811	37,557	56,386	44,266	48,858
April	20,183	26,498	35,281	28,067	39,547	42,952	24,865
May	17,795	26,350	31,943	42,243	91,433	112,418	110,544
June	16,017	28,183	32,870	52,927	43,514	44,582	38,776
July	25,611	42,224	40,877	28,692	30,335	36,300	38,226
August	40,743	63,161	57,603	72,577	52,658	57,439	53,446
September	65,745	79,118	80,066	99,261	69,255	96,948	73,325
October	74,873	118,543	134,543	131,699	111,736	145,156	145,260
November	80,936	123,316	140,655	126,149	119,394	157,086	105,556
December	90,067	128,684	138,147	148,830	122,157	175,960	127,861
	580,470	839,370	995,332	970,468	947,423	1,212,415	1,028,865

PRODUCERS' STOCKS OF FINISHED BRIQUETS

For 1930, as for 1928 and 1929, the Bureau of Mines requested information on the quantity of finished briquets on hand in producers' yards on various dates in the year. The replies show that on January 1, 1930, producers had on hand 11,259 tons, in comparison with 15,843 tons at the end of the year, indicating a net increase of 4,584 tons in stocks during the year.

As compared with the seasonal character of requirements and output, producers' stocks show little variation. For any date of record in the past three years they have never been more than 1.9 per cent or less than 1.1 per cent of the total output for the respective years. Obviously, the sharp demand during the fall and winter is met by rapidly expanded production rather than by drawing upon accumulated producers' stocks.

Producers' stocks of finished briquets in 1930, in net tons

Jan. 1, 1930	11, 259
July 1, 1930	14, 088
Oct. 1, 1930	11, 822
Jan. 1, 1931	15, 843

VALUE

The total value of the briquets manufactured during 1930 was $8,028,736, a decrease of $1,486,469, or 15.6 per cent, compared with 1929. The average value per net ton f. o. b. plant in 1930 was $7.80, compared with $7.85 in 1929 and $8.13 in 1928. The drop in the average value per ton in 1930 is in part a reflection of lower price trends for almost all solid fuels and is in part due to the fact that the proportion of the total output from the relatively low-priced product of the Eastern States was higher in 1930 than in 1929.

The sales realizations obtained on briquets in the scattered producing centers in a given year show considerable variation. For this reason the figure on average value per ton for the entire industry has doubtful significance because of the different conditions under which briquets are manufactured in certain sections of the country. Among the factors that influence the value per ton at any plant, the most important are probably the cost of raw materials and the prices of competing fuels. Hence the trend of prices from year to year is indicated best by the average value in particular localities, as shown by the following table.

Average value per net ton (f. o. b. plant) of briquets produced in Pennsylvania and in the Central States, 1911–1930

Year	Pennsylvania	Central States	Year	Pennsylvania	Central States
1911	$2. 37	$4. 34	1921	$6. 14	$9. 28
1912	2. 68	4. 47	1922	5. 93	9. 02
1913	2. 65	4. 92	1923	5. 95	9. 35
1914	2. 48	4. 83	1924	5. 82	9. 00
1915	2. 90	4. 26	1925	6. 35	8. 72
1916	3. 83	4. 73	1926	6. 74	8. 86
1917	3. 15	6. 81	1927	6. 52	8. 30
1918	4. 11	8. 17	1928	6. 38	8. 38
1919	4. 17	8. 47	1929	6. 22	8. 13
1920	5. 60	9. 23	1930	6. 22	8. 13

For the Eastern States the average value per ton f. o. b. plant in 1930 was $6.05, compared with $6.25 in 1929. The average for Pennsylvania in 1930 was $6.22, the same as for 1929, the lowest figure since 1924. In the eastern part of the country materials suitable for the manufacture of briquets are available at relatively low cost, and competition with other fuels is especially keen. The average value per ton for the Pacific Coast States was $11.44 in 1930, a gain of 62 cents over 1929. The average value of the product of the

Central States was $8.13, the same as for 1929, the lowest average since 1917.

These figures do not indicate the prices paid by consumers. Some of the plants are long distances from the markets where their product is consumed, and to the value at the plant must be added the cost of transportation and the margin of the wholesaler or the retailer, sometimes both.

PRINCIPAL EXPENSES AND VALUE ADDED BY MANUFACTURE

By far the largest item of expense in the manufacture of briquets is the cost of raw materials. A special study covering 1927 indicated that the average cost of raw materials for 16 briquetting plants throughout the country, which produced 93 per cent of the total output, was $5.09 per ton. This compared with expenditures of 17 cents per ton for salaries, 47 cents for wages, and 26 cents for purchased electric power and fuel used for power. The average value of the product in 1927 was $7.86 per ton, and the difference of $1.87 between this figure and the total of principal expenses represented the value added by manufacture. Further details of this analysis are given on page 4 of the report of this series for 1928.

DISTRIBUTION

In its questionnaire for 1930 the Bureau of Mines requested information on the methods of disposing of the briquets and the tonnage shipped to each State. The results of this inquiry are given in the two following tables. It should be noted that the commercial sales were slightly less than the total output, as unmerchantable briquets used for boiler fuel at the plant were excluded and changes in producers' stocks were taken into account.

Commercial sales[1] *of fuel briquets in 1930, by areas of distribution and by method of sales, in net tons*

	In locality of plant	In other localities	Total[1]	
			Quantity	Per cent of total
To wholesalers	1,650	140,666	142,316	13.9
To retailers	82,472	730,046	812,518	79.4
Direct to consumers	67,328	1,722	69,050	6.7
	151,450	872,434	1,023,884	100.0

[1] Total production, less 4,584 tons added to stocks and 397 tons of unmerchantable briquets used by the manufacturer as boiler fuel.

Fifteen per cent of the total sold in 1930—151,450 tons—was distributed in the immediate vicinity of the plants, and the remainder—872,434 tons—was transported to other localities for consumption. Manufacturers of briquets use several methods in disposing of their product. As will be seen in the preceding table, producers reported that 13.9 per cent of their output was sold through wholesalers, 79.4 per cent through retailers, and 6.7 per cent direct to consumers. An earlier study, covering 98 per cent of the 1923 output, indicated that

52.3 per cent of the tonnage, reported by method of sale, was sold through wholesalers, 32.2 per cent to retailers, and 15.5 per cent to consumers. (See Fuel Briquets in 1923, p. 43.) Although the evidence is not complete, the tendency in the last seven years seems to be toward increased selling to retailers, with less reliance upon the wholesaler and upon direct-to-consumer sales as methods of disposal.

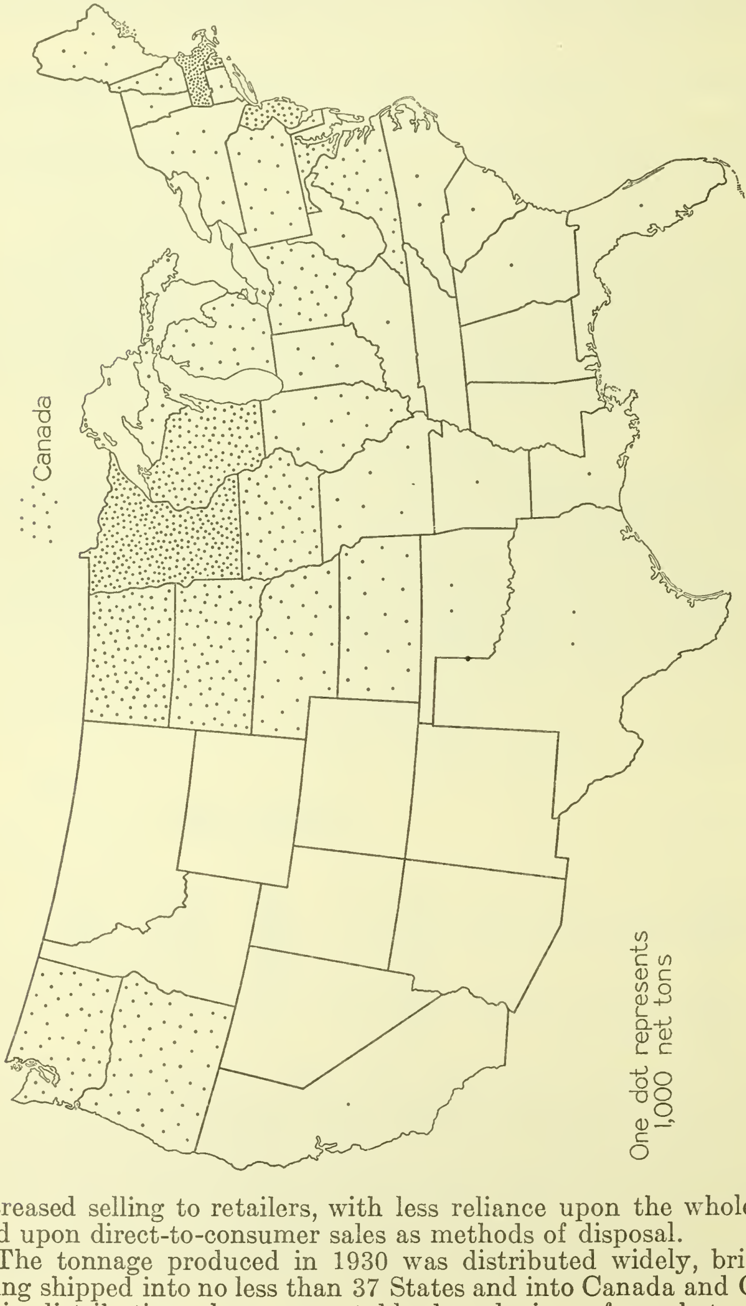

FIGURE 2.—Consumption of fuel briquets by States in 1930. Each State receiving briquets is represented by at least one dot

The tonnage produced in 1930 was distributed widely, briquets being shipped into no less than 37 States and into Canada and Cuba. This distribution shows a notable broadening of markets when compared with 1928. (See Fuel Briquets in 1928, fig. 1, p. 5.) Although a considerable proportion of the output at most briquetting operations entered markets outside of the States of manufacture, six small plants, with a combined production of less than 1 per cent of the total sales, disposed of their output entirely within the States of origin.

The foregoing map (fig. 2) gives the consumption of briquets by States in 1930. The principal regions of consumption were the Central States, Eastern States, and Pacific Coast States. In the Central States, Minnesota ranked first, followed by Wisconsin, North Dakota, South Dakota, Iowa, and Nebraska. Among the Eastern States, Massachusetts, New Jersey, Virginia, Pennsylvania, Maryland, New York, and Rhode Island, named in order of tonnage, were the principal consumers. Oregon and Washington were the principal consumers among the Pacific Coast States. The following table gives the tonnage consumed in each State in 1930:

Fuel briquets of domestic manufacture consumed in the United States and exported in 1930

	Net tons		Net tons
Consumed in—		Consumed in—	
Arkansas	[1] 100	New York	6,793
California	908	North Carolina	2,365
Connecticut	559	North Dakota	98,129
Delaware	1,042	Ohio	19,639
Florida	[1] 200	Oklahoma	1,581
Georgia	[1] 100	Oregon	48,282
Illinois	13,246	Pennsylvania	14,075
Indiana	5,422	Rhode Island	6,202
Iowa	40,857	South Carolina	211
Kansas	20,074	South Dakota	68,367
Kentucky	[1] 200	Texas	1,771
Louisiana	[1] 723	Vermont	125
Maine	4,872	Virginia	18,171
Maryland	8,750	Washington	36,714
Massachusetts	99,320	West Virginia	465
Michigan	21,032	Wisconsin	120,171
Minnesota	291,775	Exported to—	
Missouri	6,940	Canada	12,265
Nebraska	27,818	Cuba	[1] 200
New Hampshire	4,604		
New Jersey	24,797		1,028,865

[1] Partly estimated.

WEIGHT AND SHAPE OF BRIQUETS

In 1930 the Bureau of Mines for the first time asked the producers to give information on the weight, size, and shape of briquets. The results of the inquiry are given in the following table. By far the greater percentage of briquets produced was of the smaller sizes. Briquets weighing less than 3 ounces accounted for 75.7 per cent of the production, and practically all the briquets in this group weighed 2 and under 3 ounces; moreover, 18.5 per cent of the output was briquets weighing 3 and under 5 ounces; thus, 94.2 per cent of the briquets weighed less than 5 ounces. Three plants produced briquets weighing 5 to 16 ounces. Two plants manufactured the large brick-shaped briquets, the type so popular in Europe; one of these made a briquet weighing 56 ounces and the other, a briquet weighing 8 pounds. However, all the briquets weighing more than 5 ounces accounted for only 5.8 per cent of the total production.

The pillow-shaped briquet seemed to be most popular. Of the 25 plants producing, 15 reported making pillow-shaped briquets, 4 cylindrical briquets, 3 ovoid, and 2 brick-shaped; 1 did not reply.

Classification of briquet plants by prevailing weight of briquet manufactured in 1930

Weight of briquet	Number of plants	Per cent of production
Less than 2 ounces	2	75.7
2 and under 3	12	
3 and under 4	1	18.5
4 and under 5	5	
5 and under 6	1	5.8
6 and under 10	1	
10 and under 16	1	
48 ounces and over (brick-shaped)	2	
	25	100.0

NUMBER OF PLANTS IN OPERATION

Twenty-five plants reported production of briquets on a commercial scale in 1930, the same number as in 1929. In the 24 years from 1907 to 1930 the number of plants has slightly more than doubled as compared with an approximately sevenfold increase in the average annual output per plant. Average production per plant in 1930 was 41,155 tons, a decrease from 1929 and the lowest since 1921.

Although the number of plants has increased, the industry has not escaped failures. From 1907 to 1930, 50 briquetting plants were abandoned, indicating that one should weigh carefully the costs of production and the possibilities of markets before constructing a new plant. As the record of the industry shows, a number of companies are firmly established and steadily expanding their business.

The increase in the number of briquetting operations and the average output per plant over an extended period are indicated in the following table.

Number and average production of briquet plants in operation in the United States, 1907–1930

Year	Plants in operation	Average production per plant (net tons)	Year	Plants in operation	Average production per plant (net tons)
1907	11	6,048	1919	12	24,645
1908	8	11,295	1920	15	37,813
1909	16	8,729	1921	15	26,597
1910	(1)	(1)	1922	14	44,245
1911	21	10,402	1923	14	49,772
1912	19	11,582	1924	12	48,373
1913	17	10,698	1925	17	49,375
1914	16	15,665	1926	19	52,386
1915	15	14,769	1927	19	51,077
1916	15	19,677	1928	21	45,115
1917	13	31,297	1929	25	48,497
1918	12	39,770	1930	25	41,155

[1] No canvass for 1910.

A list of the 25 plants active in 1930 follows. Four plants active in 1929 produced no briquets in 1930, but four new ones began commercial operation during the year—the Glen Smith Fuel Co., Council Bluffs, Iowa; the Grande Brick Co., Grand Rapids, Mich.; the Magnolia Petroleum Co., Beaumont, Tex.; and the Winding Gulf Collieries, Davy, W. Va. The West Virginia Super Fuel Co., of Moundsville, changed its name to the Coal Distillation Co. of West Virginia during the year.

Briquetting plants operated in the United States in 1930

State	Name and address of operator	Location of plant	Date put in operation	Raw fuel used, as reported by producer
Eastern States:				
Massachusetts	American Briquet Co., 1505 Philadelphia Bank Building, Philadelphia, Pa.	Charlestown	1929	Anthracite and bituminous slack.
Do	Salem Briquette Co., Salem, Mass.	Salem	1927	Anthracite.
New Jersey	Anthracite Manufacturing Co., 500 Brunswick Avenue, Trenton, N. J.	Trenton	1918	Do.
Do	Navicoal Corporation, 1421 Chestnut Street, Philadelphia, Pa.	Keasbey	1925	Anthracite and bituminous slack.
Pennsylvania	American Briquet Co., 1505 Philadelphia Bank Building, Philadelphia, Pa.	Lykens	1920	Anthracite.
Do	Henriette Coal Mining Co., 15 Moore Street, New York, N. Y.	Dunlo	1929	Bituminous slack.
Do	Philadelphia & Reading Coal & Iron Co., Twelfth and Market Streets, Philadelphia, Pa.	North Manheim Township.	1927	Anthracite.
Virginia	Virginia Fuel Corporation, P. O. Box 505, Norfolk, Va.	Portlock	1923	Anthracite and bituminous slack.
West Virginia	Berwind Fuel Co. of West Virginia, 122 South Michigan Avenue, Chicago, Ill.	Berwind	1929	Bituminous slack.
Do	Coal Distillation Co. of West Virginia, 712 Park Building, Pittsburgh, Pa.	Moundsville	1927	Semicoke.[1]
Do	Winding Gulf Collieries, P. O. Box 30, Bluefield, W. Va.	Davy	1930	Bituminous slack.
Central States:				
Iowa	Glen Smith Fuel Co., Patterson Building, Omaha, Nebr.	Council Bluffs	1930	Oklahoma semianthracite and petroleum carbon.
Michigan	Grande Brick Co., 1456 Fuller Avenue, Grand Rapids, Mich.	Grand Rapids	1930	Bituminous slack.
Missouri	Standard Briquet Fuel Co., 818 Security Building, St. Louis, Mo.	Kansas City	1909	Arkansas anthracite and semianthracite slack.
North Dakota	Lehigh Briquetting Co., Fargo, N. Dak.	Lehigh	1929	Semicoke.[1]
Oklahoma	Lincoln Power Co., 105 West Adams Street, Chicago, Ill.	Howe	1929	Bituminous slack.
Texas	Magnolia Petroleum Co., P. O. Box 798, Beaumont, Tex.	Beaumont	1930	Petroleum coke.
Wisconsin	Berwind Fuel Co., 122 South Michigan Avenue, Chicago, Ill.	Superior	1912	Semibituminous slack.
Do	Stott Briquet Co., Merchants National Bank Building, St. Paul, Minn.	do	1909	Anthracite fines and bituminous slack.
Do	United Coal & Dock Co., 8 West Wells Street, Milwaukee, Wis.	Milwaukee	1928	Bituminous slack.
Pacific Coast States:				
California	San Diego Gas & Electric Corporation, Electric Building, San Diego, Calif.	San Diego	1925	Carbon (petroleum residue) from oil gas.
Oregon	Portland Gas & Coke Co., Public Service Building, Portland, Oreg.	Portland	1913	Do.
Washington	Pacific Coast Coal Co., Smith Tower, Seattle, Wash.	Renton	1914	Coking bituminous slack and free-burning slack.
Do	Paramount Briquet Co., 1721 Northlake Place, Seattle, Wash.	Seattle	1929	Bituminous slack.
Do	Wilkeson Coal & Coke Co., Wilkeson, Wash.	Fairfax	1926	Do.

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[1] The residue of low-temperature carbonization of bituminous coal or lignite.

CAPACITY OF PLANTS

As more than half of the plants worked 14 to 24 hours during the busy season, the measurement of capacity on an hourly basis affords a good indication of potential output. In 1930, four plants had a capacity of less than 5 tons per hour, and the two largest had a capacity exceeding 75 tons. In 1930, five plants had an hourly capacity of more than 50 tons.

Classification of briquet plants, by hourly capacity in 1930

Capacity per hour	Number of plants
Less than 5 net tons	4
5 and less than 10	4
10 and less than 25	7
25 and less than 50	5
50 and less than 75	3
75 net tons and over	2
	25

A further conception of the prevailing size of the briquetting operations may be obtained by grouping them according to their total production in 1930. As the following table shows, 5 plants produced less than 2,000 tons during the year, 6 produced 10,000 to 25,000 tons, and 5 produced 25,000 to 100,000 tons. In 1930, as in years immediately preceding, the output of two plants exceeded 200,000 tons. Inasmuch as the Bureau of Mines classifies a coal mine producing 200,000 tons as a "large" mine and groups all mines above that limit in "Class 1," it is evident that some of the briquetting plants are of considerable size.

Classification of briquet plants, by size of output in 1930

Output	Number of plants
Less than 2,000 net tons	5
2,000 and less than 5,000	1
5,000 and less than 10,000	5
10,000 and less than 25,000	6
25,000 and less than 100,000	5
100,000 and less than 200,000	1
200,000 net tons and over	2
	25

HOURS OPERATED PER DAY

As already noted, the sharp seasonal demand for briquets is met by rapidly expanded production rather than from accumulations of producers' stocks. Hence, during the busy season, many plants work two or even three shifts a day. Fifteen plants, producing 88 per cent of the total output in 1930, reported that they operated 14 hours or more a day. The 10 plants working 5 to 12 hours a day contributed only 12 per cent of the total production.

Classification of briquet plants, by number of hours operated per day during busy season in 1930

Hours per day	Number of plants	Production (net tons)
14 to 24 hours	15	900,971
5 to 12 hours	10	127,894
	25	1,028,865

RAW FUELS

A total of 1,004,365 net tons of raw fuel of all kinds was briquetted in 1930; 37 per cent of this amount was anthracite and semianthracite, 57 per cent semibituminous and bituminous coal, and 6 per cent semicoke, carbon residue from the manufacture of oil gas, or petroleum coke.

Three plants reported that from a small portion to all of the raw coal used was washed either by the colliery operator or the briquet manufacturer.

Raw fuels used in making briquets in the United States, 1925–1930, in net tons

Fuel	1925	1926	1927	1928	1929	1930
Anthracite culm and fine sizes and semianthracite	383,189	426,064	359,438	376,257	408,967	368,294
Semibituminous, bituminous, and subbituminous slack	394,486	480,684	521,318	512,806	[1]711,459	[1]569,057
Semicoke, oil-gas residue, and petroleum coke	66,915	64,387	70,052	51,743	67,513	67,014
	844,590	971,135	950,808	940,806	1,187,939	1,004,365

[1] Includes no subbituminous coal.

In 1930 anthracite fines were used as raw material at 10 operations either alone or in combination with other coal. Bituminous coal alone was used at nine plants. The character of the raw fuel used by the 25 active plants was as follows:

Classification of briquet plants, by kinds of raw fuel used in 1930

Kind of raw fuel used	Number of plants
Anthracite fines	5
Mixture of anthracite or semianthracite fines and bituminous or semibituminous slack	5
Bituminous slack	9
Semibituminous fines	1
Semicoke (low-temperature coke or char)	2
Carbon residue from the manufacture of oil gas	2
Petroleum coke	1
	25

BINDERS AND RECARBONIZATION

Asphaltic pitch is the binder used most often in the manufacture of briquets and was employed either alone or in combination by 21 out of the 25 plants active in 1930. Of the producers, 16 used asphaltic pitch exclusively; 1, asphaltic pitch and coal-tar pitch; 2, a mixture of starch, asphalt, and water; 1, lignite pitch and asphalt pitch; 1, mixed pitches; 1, sulphite liquor; and 1, "cement." Two plants, briquetting the carbon residue or lampblack from the manufacture of oil gas, required no binder.

The percentage of binder to raw fuel, by weight, ranged from less than 5 to 9 per cent or more. The proportion most commonly used was 5 or 6 per cent.

Classification of briquet plants, by percentage of binder used in 1930

Binder used	Number of plants
Using no binder (carbon residue)	2
Using—	
Less than 5 per cent binder	4
5 and less than 7 per cent	13
7 and less than 9 per cent	2
9 per cent and over	4
	25

Three of the producers using a binder, whose total output was 22,896 tons, reported that they recarbonized the briquets coming from the presses to drive off smoke from the binder.

FOREIGN TRADE IN BRIQUETS

Imports of fuel briquets in 1930 were 73,418 net tons, a decrease of 16,040 tons, or 18 per cent, from 1929. Before 1922 the quantity of briquets imported was negligible. The anthracite shortages of 1922–23 and 1925–26, however, accelerated the introduction of the European product into the New England market. Although supplies of anthracite have been abundant from 1927 to 1930, the volume of briquet imports has persisted at high level when compared with the period before 1926. In 1930 the imports were equivalent to 7.1 per cent of the domestic production.

According to the customs records 62,253 tons, or 84.8 per cent of the total imported in 1930, was discharged at or in the vicinity of Boston; 11,125 tons was imported into Maine and New Hampshire. Very small tonnages were also imported into New York and Vermont.

Of the total imports 73,378 tons, or 99.9 per cent, came from Germany, 39 tons from France, and 1 ton from Canada.

Briquets and other composition coals for fuels imported for consumption in the United States, 1919–1930[1]

Year	Net tons	Value	Year	Net tons	Value
1919	136	$1,050	1925	6,758	$43,931
1920	(2)	9	1926	123,593	736,804
1921	66	251	1927	60,601	314,435
1922	34,862	139,382	1928	71,485	353,168
1923	19,559	103,201	1929	89,458	458,517
1924	38	443	1930	73,418	399,146

[1] Compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

[2] 112 pounds.

The accompanying table shows that the volume of imports from month to month during the year exhibits much the same seasonal trend that production normally follows.

Fuel briquets imported into the United States in 1930, by months

[General imports]

Month	Net tons	Month	Net tons
January	22,146	September	4,706
February	8,780	October	3,136
March	560	November	6,953
April	6,053	December	21,077
June	7		
			73,418

WORLD PRODUCTION

The world production of briquetted fuel is now about 60,000,000 metric tons a year. Germany is by far the largest producer and usually accounts for more than three-fourths of the world total. France and Belgium are the second and third largest producers. At present the United States contributes approximately 2 per cent of the world production. The briquetting industry has attained its greatest development in countries where a large part of the available fuel is of low grade and where market conditions warrant its conversion from the raw state to briquets.

World production of fuel briquets, 1926–1930, in metric tons

[Compiled by M. T. Latus, of the Bureau of Mines]

Country[1]	1926	1927	1928	1929	1930
Algeria	57,442	83,338	33,767	101,552	(2)
Austria	----------	----------	----------	420	(2)
Belgium	2,142,660	1,688,970	1,959,130	1,999,280	1,902,040
Czechoslovakia:					
Coal	181,797	160,254	214,613	270,294	239,081
Lignite	197,211	211,770	241,174	256,111	180,859
France	6,142,355	3,904,160	4,061,838	4,634,866	4,776,905
Germany:[3]					
Coal	5,901,593	5,554,980	5,375,842	5,554,480	4,691,028
Lignite	34,358,043	36,489,901	40,157,264	42,268,752	33,999,210
Saar	746	285	----------	----------	(2)
Great Britain	850,774	1,502,053	1,151,270	1,394,898	(2)
Greece	----------	86	----------	----------	(2)
Hungary:					
Coal }	58,851	42,553	56,165	109,570	(2)
Lignite }					
Indo-China	97,456	119,700	103,518	113,225	(2)
Italy	----------	----------	----------	6,716	(2)
Netherlands:					
Coal	714,884	662,210	785,829	958,186	(2)
Lignite	70,256	69,111	69,091	54,498	(2)
Netherland East Indies	96,159	112,543	82,629	64,099	(2)
Poland	239,160	252,779	264,362	354,783	234,123
Spain	686,707	803,127	846,645	921,906	959,993
United States	902,945	880,389	859,483	1,099,879	933,366
Venezuela	2,399	2,297	1,232	1,691	(2)
Yugoslavia	(4)	(4)	27,582	51,477	(2)
	52,731,438	52,570,506	56,291,434	60,216,683	(2)

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[1] In addition to the countries listed briquets are produced in Australia, Canada, and New Caledonia, but data of output are not available.
[2] Data not available.
[3] Exclusive of the Saar.
[4] Estimate included in total.

FLUORSPAR AND CRYOLITE [1]

By Hubert W. Davis

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FLUORSPAR

Fluorspar (or fluorite) is a compound of calcium and fluorine and consists chemically of 51.1 per cent of calcium and 48.9 per cent of fluorine. It has a specific gravity of 3.2, is brittle, has a hardness of 4, can be scratched easily with a knife, weighs about 200 pounds per cubic foot, and has a melting point of 1,650° F. Fluorspar crystallizes in the isometric system and is often found in cubical crystals. It is a mineral of many colors, ranging according to purity from a clear, colorless, or slightly bluish glasslike substance through various hues of purple, green, yellow, pink, lavender, and brown. Most fluorspar contains silica or calcite, or both, and usually some iron oxide and alumina. Other more or less common associated minerals are barite, galena, and sphalerite.

Like most mineral industries, the fluorspar industry felt the effects of the general depression in 1930. Salient features of the fluorspar industry in 1930 include the substantial decrease in domestic shipments; the pronounced increase in imports from Germany and France; the increase, effective June 18, from $5 to $7.50 a short ton in the rate of duty on fluorspar that contains 93 to 97 per cent of calcium fluoride; the large stocks of fluorspar at consumers' plants on December 31, especially the stocks of 89,000 short tons that have been accumulated at basic open-hearth steel plants; and the first river-rail shipments of fluorspar to the Pittsburgh district.

Another noteworthy feature of the fluorspar industry in 1930 that should not be overlooked in any summary of conditions is the fact that, although demand did not justify it, many companies kept their mines and mills operating to an extent that would support a large proportion of their employees, even though to have closed probably would have meant a considerable saving to the companies themselves.

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[1] Work on manuscript completed April, 1931.

PRODUCTION AND SHIPMENTS

In 1930 fluorspar was produced at 65 mines or prospects, which yielded an equivalent of about 130,000 short tons of merchantable fluorspar.

The shipments of fluorspar to each of the industries in which the mineral is used, except the cement industry, decreased in 1930. Domestic producers shipped 35 per cent less fluorspar to steel plants and 37 per cent less fluorspar to foundries in 1930 than in 1929. In the ceramic industries the shipments of fluorspar to manufacturers of glass and enamel decreased 45 and 44 per cent, respectively, but the shipments to cement plants were a little more in 1930 than in 1929. Although shipments of acid-grade fluorspar from domestic mines in 1930 were 24 per cent less than those in 1929, they were equivalent to about 78 per cent of the total fluorspar consumed in the United States in 1930 in the manufacture of hydrofluoric acid, whereas shipments of domestic acid-grade fluorspar in 1929 were equivalent to about 83 per cent of the total.

In 1930 shipments of fluorspar from domestic mines aggregated 95,849 short tons, valued at $1,746,643, a decrease of 35 per cent in quantity and 37 per cent in total value compared with 1929. The general average value for all grades was $18.22 a ton, 84 cents less than the 1929 average. The value recorded for the domestic fluorspar is the price paid f. o. b. mine shipping point by the consumer and excludes the cost of containers. In 1930 the general average value of the fluorspar shipped to steel plants from the Illinois-Kentucky field was $16.99 a ton, and from the Colorado-New Mexico district, $11.43 a ton. This difference in average values represents chiefly economic factors in marketing rather than differences in quality of fluorspar from these two districts.

The table that follows presents such details of the shipments of fluorspar for 1927 to 1930, by States, as may be published without revealing, except by permission, data supplied by individual producers.

Fluorspar shipped from mines in the United States, 1927–1930

State	Gravel			Lump			Ground			Total		
	Short tons	Value		Short tons	Value		Short tons	Value		Short tons	Value	
		Total	Average		Total	Average		Total	Average		Total	Average
1927												
Illinois	38,970	$656,863	$16.86	2,471	$105,062	$21.18	4,565	$330,356	$31.31	46,006	$863,909	$18.78
Kentucky	50,533	839,933	16.62	1,454			5,508			57,495	1,040,338	18.09
New Mexico	1,562	102,514	13.61	574			477			2,613	130,481	14.43
Colorado	5,971			461			----------	----------	----------	6,432		
	97,036	1,599,310	16.48	4,960	105,062	21.18	10,550	330,356	31.31	112,546	2,034,728	18.08
1928												
Illinois	56,555	876,819	15.50	4,066	161,603	26.12	5,263	368,417	29.99	65,884	1,154,983	17.53
Kentucky	62,528	1,212,760	19.40	1,428			5,791			69,747	1,426,766	20.46
New Mexico	961	36,955	12.58	399			1,229			2,589	74,805	15.40
Colorado	1,562			253			----------	----------	----------	1,815		
Nevada	415			40			----------	----------	----------	455		
	122,021	2,126,534	17.43	6,186	161,603	26.12	12,283	368,417	29.99	140,490	2,656,554	18.91
1929												
Illinois	59,101	1,046,748	17.71	2,926	201,725	24.23	4,982	358,147	32.38	67,009	1,284,834	19.17
Kentucky	60,393	1,087,593	18.01	4,356			6,078			70,827	1,390,603	19.63
Colorado	4,508	96,913	12.82	300			----------	----------	----------	4,808	56,607	11.77
New Mexico	2,295			143			----------	----------	----------	2,438	59,082	15.57
Nevada	757			600			----------	----------	----------	1,357		
	127,054	2,231,254	17.56	8,325	201,725	24.23	11,060	358,147	32.38	146,439	2,791,126	19.06
1930												
Illinois	38,702	680,211	17.58	2,107	98,672	23.05	3,325	216,979	33.52	44,134	836,473	18.95
Kentucky	34,129	608,313	17.82	1,903			3,149			39,181	763,370	19.48
Colorado	9,198	142,468	11.62	50			----------	----------	----------	9,248	101,758	11.00
New Mexico	2,188			124			----------	----------	----------	2,312	45,042	13.71
Nevada	877			97			----------	----------	----------	974		
	85,094	1,430,992	16.82	4,281	98,672	23.05	6,474	216,979	33.52	95,849	1,746,643	18.22

HISTORY OF PRODUCTION

The accompanying table presents statistics of the production of fluorspar by States, beginning with 1880. The record of production before 1880 was not obtained and the statistics for Kentucky and Colorado are incomplete for certain years after 1880, so that more fluorspar has been mined than the table shows. The unrecorded output must be small, however, since the advantages of fluorspar over limestone as a flux in basic open-hearth steel plants have been generally recognized only since about 1899. Before that time fluorspar was used mainly in the preparation of hydrofluoric acid and in the manufacture of opalescent glass; consequently the demand was small.

The production of fluorspar by years for 1880 to 1904, a brief discussion of the history of mining in the different States, and estimates of unrecorded output in early years are given in Mineral Resources, 1925, Part II, pages 9 to 14.

Fluorspar produced[1] in the United States, 1880–1930, by States

Year	Arizona		Colorado		Illinois		Kentucky		Nevada		New Hampshire		New Mexico		Tennessee		Utah		Washington		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1880–1904	654	$6,593	-----	-----	169,870	$1,037,399	134,186	$740,467	-----	-----	-----	-----	-----	-----	400	$3,400	-----	-----	-----	-----	305,110	$1,787,859
1905	-----	-----	1,156	$8,200	33,275	220,206	22,694	132,362	-----	-----	-----	-----	-----	-----	260	1,720	-----	-----	-----	-----	57,385	362,488
1906	-----	-----	300	1,800	28,268	160,623	11,868	79,802	-----	-----	-----	-----	-----	-----	360	1,800	-----	-----	-----	-----	40,796	244,025
1907	-----	-----	3,300	11,400	25,128	141,971	21,058	133,971	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	49,486	287,342
1908	34	252	701	4,266	31,727	172,838	6,323	48,642	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	38,785	225,998
1909	30	435	350	2,100	41,852	232,251	7,800	53,233	-----	-----	-----	-----	710	$3,728	-----	-----	-----	-----	-----	-----	50,742	291,747
1910	-----	-----	268	1,608	47,302	277,764	17,003	124,574	-----	-----	-----	-----	4,854	26,250	-----	-----	-----	-----	-----	-----	69,427	430,196
1911	-----	-----	721	4,226	68,817	481,635	12,403	96,574	-----	-----	800	$6,400	4,307	22,612	-----	-----	-----	-----	-----	-----	87,048	611,447
1912	-----	-----	1,639	9,834	103,937	695,467	10,473	61,186	-----	-----	300	1,500	196	1,176	-----	-----	-----	-----	-----	-----	116,545	769,163
1913	100	800	4,432	26,592	85,854	550,815	19,622	113,903	-----	-----	200	1,200	5,372	42,976	-----	-----	-----	-----	-----	-----	115,580	736,286
1914	-----	-----	1,978	12,992	73,811	426,063	19,077	128,986	-----	-----	250	2,000	-----	-----	-----	-----	-----	-----	-----	-----	95,116	570,041
1915	-----	-----	247	1,482	116,340	624,040	19,219	129,873	-----	-----	650	5,200	485	3,880	-----	-----	-----	-----	-----	-----	136,941	764,475
1916	199	2,587	8,669	42,457	126,369	746,150	19,698	123,596	-----	-----	800	7,864	-----	-----	-----	-----	-----	-----	-----	-----	155,735	922,654
1917	135	1,080	17,104	196,633	156,676	1,373,333	43,639	697,566	-----	-----	1,274	19,110	-----	-----	-----	-----	-----	-----	-----	-----	218,828	2,287,722
1918	364	5,537	38,475	416,780	132,798	2,887,099	87,604	2,069,185	-----	-----	1,059	21,243	3,437	64,348	-----	-----	20	$465	60	$824	263,817	5,465,481
1919	45	450	9,687	150,739	92,729	2,430,361	32,386	883,171	400	$5,600	531	12,826	2,346	37,643	-----	-----	166	4,784	-----	-----	138,290	3,525,574
1920	181	3,264	12,852	251,308	120,299	3,096,767	46,091	1,246,942	532	8,672	202	4,040	6,353	101,460	-----	-----	268	6,094	-----	-----	186,778	4,718,547
1921	-----	-----	3,143	39,907	12,477	315,767	15,266	294,513	-----	-----	567	13,721	3,507	60,186	-----	-----	-----	-----	-----	-----	34,960	724,094
1922	-----	-----	2,309	20,169	83,855	1,493,188	52,484	970,059	-----	-----	690	15,353	2,180	30,992	-----	-----	78	1,404	-----	-----	141,596	2,531,165
1923	-----	-----	6,044	59,710	65,045	1,443,490	45,441	945,402	-----	-----	142	3,160	4,328	50,861	-----	-----	188	3,196	-----	-----	121,188	2,505,819
1924	-----	-----	12,301	135,411	62,067	1,288,310	47,847	988,940	-----	-----	-----	-----	2,580	35,178	-----	-----	184	3,292	-----	-----	124,979	2,451,131
1925	-----	-----	11,776	153,707	54,428	1,024,516	44,826	833,794	-----	-----	-----	-----	2,639	40,325	-----	-----	-----	-----	-----	-----	113,669	2,052,342
1926	-----	-----	10,440	[2] 161,269	53,734	1,012,879	62,494	1,167,129	-----	-----	-----	-----	1,989	(2)	-----	-----	-----	-----	-----	-----	128,657	2,341,277
1927	-----	-----	6,432	[2] 130,481	46,006	863,909	57,495	1,040,338	-----	-----	-----	-----	2,613	(2)	-----	-----	-----	-----	-----	-----	112,546	2,034,728
1928	-----	-----	1,815	[2] 74,805	65,884	1,154,983	69,747	1,426,766	455	(2)	-----	-----	2,589	(2)	-----	-----	-----	-----	-----	-----	140,490	2,656,554
1929	-----	-----	4,808	56,607	67,009	1,284,834	70,827	1,390,603	1,357	(3)	-----	-----	2,438	[3] 59,082	-----	-----	-----	-----	-----	-----	146,439	2,791,126
1930	-----	-----	9,248	101,758	44,134	836,473	39,181	763,370	974	(3)	-----	-----	2,312	[3] 45,042	-----	-----	-----	-----	-----	-----	95,849	1,746,643
	1,742	20,998	170,195	[2] 2,076,241	2,009,691	26,273,131	1,036,752	16,684,947	3,718	[2] [3] 14,272	7,465	113,617	55,235	[2] [3] 625,739	1,020	6,920	904	19,235	60	824	3,286,782	45,835,924

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[1] Beginning with 1906 figures represent shipments from mines.

[2] Value for New Mexico for 1926, 1927, and 1928 and for Nevada for 1928 included with Colorado.

[3] Value for Nevada for 1929 and 1930 included with New Mexico.

SHIPMENTS, BY USES

The two tables that follow show the relative dependence of the fluorspar industry on the different industries in which fluorspar is used. The predominance of the steel industry as a purchaser of fluorspar is evident. The high value of fluorspar for hydrofluoric acid, glass, and enamel is due to the high quality demanded.

Fluorspar shipped from mines in the United States, 1929 and 1930, by uses

Use	1929				1930			
	Percentage	Short tons	Value		Percentage	Short tons	Value	
			Total	Average			Total	Average
Steel	81.20	118,904	$2,031,248	$17.08	80.17	76,837	$1,239,679	$16.13
Foundry	2.39	3,498	69,712	19.93	2.30	2,209	41,281	18.69
Glass	3.92	5,742	183,641	31.98	3.30	3,158	103,947	32.92
Enamel and vitrolite	2.65	3,879	125,646	32.39	2.28	2,188	73,549	33.61
Hydrofluoric acid and derivatives	8.81	12,906	354,235	27.45	10.26	9,834	260,130	26.45
Miscellaneous	.69	1,004	15,023	14.96	1.40	1,342	21,897	16.32
	99.66	145,933	2,779,505	19.05	99.71	95,568	1,740,483	18.21
Exported	.34	506	11,621	22.97	.29	281	6,160	21.92
	100.00	146,439	2,791,126	19.06	100.00	95,849	1,746,643	18.22

Fluorspar shipped from mines in the United States, 1921–1930, by uses

Year	Steel		Foundry		Glass		Enamel and vitrolite	
	Short tons	Average value	Short tons	Average value	Short tons	Average value	Short tons	Average value
1921	25,553	$15.94	1,521	$20.14	[1]5,599	[1]$40.03	(1)	(1)
1922	122,403	16.24	2,998	19.02	[1]8,904	[1]36.29	(1)	(1)
1923	96,713	18.23	3,748	21.20	[1]10,768	[1]36.17	(1)	(1)
1924	104,349	17.72	7,138	22.35	6,094	35.16	3,471	$34.85
1925	91,760	16.16	6,275	19.31	6,767	31.23	3,237	31.22
1926	105,614	16.51	6,212	19.55	7,507	32.01	3,410	33.27
1927	93,196	16.35	4,533	18.69	5,968	30.91	3,813	31.44
1928	108,064	15.19	3,694	17.93	6,499	30.14	4,713	30.23
1929	118,904	17.08	3,498	19.93	5,742	31.98	3,879	32.39
1930	76,837	16.13	2,209	18.69	3,158	32.92	2,188	33.61

Year	Hydrofluoric acid and derivatives		Miscellaneous		Exported		Total	
	Short tons	Average value	Short tons	Average value	Short tons	Average value	Short tons	Average value
1921	1,833	$28.62	454	$21.23			34,960	$20.71
1922	4,782	24.81	213	18.02	2,296	$17.84	141,596	17.88
1923	6,976	30.19	1,839	20.85	1,144	22.13	121,188	20.68
1924	3,150	28.39	160	21.13	617	23.48	124,979	19.61
1925	4,455	25.60	120	39.00	1,055	16.66	113,669	18.06
1926	3,410	23.20	372	21.47	2,132	16.38	128,657	18.20
1927	3,748	26.24	903	17.59	385	19.50	112,546	18.08
1928	15,946	36.69	1,176	16.23	398	16.55	140,490	18.91
1929	12,906	27.45	1,004	14.96	506	22.97	146,439	19.06
1930	9,834	26.45	1,342	16.32	281	21.92	95,849	18.22

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[1] Shipments for enamel and vitrolite included with shipments for glass.

INDUSTRY IN 1930, BY STATES

COLORADO

Although the mining of fluorspar in Colorado dates back to the early seventies, when deposits were opened in Jefferson and Boulder Counties, the total production through 1930 has amounted to only about 175,000 short tons.

Before the Wagon Wheel Gap mine in Mineral County was opened in 1913, the total fluorspar produced in Colorado amounted to about 13,000 short tons, most of which was mined in the Jamestown district, Boulder County, where very little systematic mining has been done. The fluorspar mines in Boulder County are comparatively small and have been worked irregularly, so that notwithstanding the longer period of operation the total production of the county through 1930 has amounted to only about 57,000 short tons, or 33 per cent of the total for the State.

The chief fluorspar mine in Colorado is the Wagon Wheel Gap mine, which has been developed in a systematic way. The initial shipment from this mine was made in 1913; since then about 98,000 short tons of fluorspar, or 56 per cent of the total for the State, has been shipped.

The only other county in Colorado with any substantial output of fluorspar is Jackson County, where a mine about 3 miles northwest of Northgate was opened in 1922; it was closed in 1926. This mine has contributed 14,805 short tons of fluorspar, or 8 per cent of the total for the State.

The remainder of the fluorspar produced in Colorado has been mined in Chaffee, Custer, El Paso, Gilpin, Ouray, and Park Counties.

Shipments of fluorspar from Colorado mines in 1930 amounted to 9,248 short tons, an increase of 92 per cent over 1929. Of the 1930 total, 9,198 tons was for use in basic open-hearth steel plants and 50 tons in foundries.

The Wagon Wheel Gap mine, 1¼ miles southwest of Wagon Wheel Gap, in Mineral County, was the chief producer of fluorspar in Colorado in 1930. This mine, owned by the Colorado Fuel & Iron Co., is the chief source of supply for the company's steel plant at Pueblo, Colo.

In the Jamestown district, Boulder County, the Argo, Blue Jay, Brown Spar, Chancellor, Emmett, and Nations Treasure mines were worked to some extent in 1930. The production in Boulder County in 1930 amounted to 1,177 short tons, or 66 per cent less than in 1929. The ore from the Argo, Blue Jay, Brown Spar, and Emmett mines—1,610 tons—was treated in the mill at Jamestown, and yielded 805 tons of concentrates; this material was hauled 18 miles to Boulder, the railroad shipping point, whence most of it was shipped to Pueblo. The Chancellor mine produced 297 tons of fluorspar and the Nations Treasure mine 75 tons, all of which was shipped to the steel plant at Pueblo without treatment.

A new development in Colorado is in Jefferson County near Longview, where 13 short tons of fluorspar was mined in 1930 but not shipped until January 19, 1931. The fluorspar from this property is hauled 4 miles to South Platte, Colo., the railroad shipping point.

An analysis by the Colorado Fuel & Iron Co., to which the fluorspar was sold, indicates percentages of the principal constituents as follows:

	Per cent		Per cent
CaF_2	93.06	$CaCO_3$	0.5
Fe_2O_3–Al_2O_3	2.33	Moisture	1.00
SiO_2	1.69		

The Bertschy prospect, a new development in Chaffee County, noted in the chapter of this series for 1929, and other adjoining prospects were acquired during 1930 by the American Fluorspar Corporation. The mining activities of this corporation in 1930 were confined chiefly to prospecting, in the course of which 175 short tons of fluorspar was mined and shipped to Pueblo, Colo.

The names and addresses of the producers of fluorspar in Colorado in 1930 follow:

Producers of fluorspar in Colorado in 1930

American Fluorspar Corporation	Colorado Springs, Colo.
Colorado Fuel & Iron Co	Pueblo, Colo.
Dopp, Fred C	Jamestown, Colo.
Hardy & Jamison	Do.
Linkston Farms	Buena Vista, Colo.
McMahon, P. S	Longview, Colo.
Terry, E. R	Jamestown, Colo.

ILLINOIS

Hardin County in southern Illinois is noted for its deposits of fluorspar; they are the largest and most important in the United States. Small quantities of lead and zinc are also recovered in connection with the mining and milling of fluorspar. The fluorspar region extends into Pope County adjoining and across the Ohio River into Kentucky. The presence of fluorspar in southern Illinois was known in the early years of the nineteenth century, but no mining of the mineral was attempted until 1842 when development was undertaken at a site near the present Rosiclare mine. Since 1842 mining operations appear to have been carried on more or less continuously, but shipments of fluorspar apparently did not begin until about 1870. No figures are available as to the quantity of fluorspar shipped from Illinois before 1880; it probably did not exceed 20,000 tons. The total shipments of fluorspar from Illinois from 1880 to 1930, inclusive, are recorded as 2,009,691 short tons. As about 20,000 tons was shipped before 1880 the total shipments since the beginning of operations may conservatively be stated as approximately 2,030,000 tons.

The greater part of the fluorspar produced in Illinois has been mined from the Rosiclare-Good Hope veins, on which are the Annex, Good Hope, Extension, Rosiclare, and Hillside mines. The Rosiclare has been the most productive mine in the district; it is also the oldest mine, having been in almost continuous operation since the earliest days of mining in the district until 1923, when it was flooded by high water from the Ohio River. The Rosiclare is also the deepest mine in the district, having been opened to a depth of 720 feet.

Second in importance are the Daisy-Blue Diggings veins, on which are the Daisy, Argo, and Blue Diggings mines.

These veins are found in fault fissures and attain maximum widths of nearly 40 feet, the average vein reaching a width of 5 to 15 feet; they are nearly vertical and lie in limestone and sandstone.

The third most productive source of fluorspar in Illinois is the Cave in Rock district, in which deposits of fluorspar occur in flat-lying tabular masses, locally called blanket formations. These deposits were worked in only a small way until about 1918. In 1918 the Spar Mountain mine was opened and since that time, except in 1924 and 1925, has been a regular shipper; its total shipments through 1930 have amounted to about 82,000 short tons. In 1927 the Victory mine, adjoining the Spar Mountain mine, was opened; it has produced a substantial tonnage. In 1929 development was begun at the Crystal mine.

North of the mines on the Rosiclare-Good Hope and Daisy-Blue Diggings veins are many scattered deposits; these have been worked from time to time and in the aggregate have contributed a substantial tonnage of fluorspar.

In Pope County the principal producing mines at present are those of the Empire-Knight-Douglas group.

In 1930 about 111,300 short tons of fluorspar-bearing rock, equivalent to about 63,800 tons of merchantable fluorspar, was mined at 12 mines or prospects in Illinois. The quantity of fluorspar of Illinois origin milled in 1930 aggregated about 112,900 tons, from which was recovered about 64,300 tons of merchantable fluorspar—a loss of 48,600 tons in milling and a ratio of 1.76:1. Shipments of fluorspar from Illinois to consumers amounted to 44,134 short tons, a decrease of 34 per cent from 1929; of this total, 21,575 tons was moved to its destination by the Ohio River. The fluorspar shipped from Illinois in 1929 and 1930 was reported distributed among the various industries as follows:

Distribution among the various industries of fluorspar from Illinois, 1929 and 1930, in short tons

Industry	1929	1930
Steel	58, 153	37, 156
Foundry	1, 388	1, 448
Glass	2, 309	1, 315
Enamel	1, 694	1, 265
Hydrofluoric acid	3, 411	2, 718
Miscellaneous	33	163
	66, 988	44, 065
Exported	21	69
	67, 009	44, 134

The Daisy mine, one-half mile north of Rosiclare, Hardin County, was again the largest producer of fluorspar in Illinois. Methods of exploration, development, and mining at this mine have been described in detail by Cronk.[2] The shaft, which is sunk in the footwall of the Daisy fault, is 5 feet 6 inches by 15 feet inside the timbers and has attained a depth of 640 feet to the present lowest level. The Daisy and Blue Diggings veins are connected by crosscuts at the 412, 537, and 640 foot levels, and ore from both veins is mined through the Daisy shaft. The Daisy mine is served by the Rosiclare mill, eight-tenths mile south of the mine; the ore is milled to products suitable for use in the metallurgical, ceramic, and chemical industries.

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[2] Cronk, A. H., Mining Methods of the Rosiclare Lead & Fluorspar Mining Co., Rosiclare, Ill.: Inf. Circ. 6384, Bureau of Mines, December, 1930, 13 pp.

The Daisy mine and the Rosiclare mill normally operate on a 6-day week schedule, working two 8-hour shifts. In 1930 the mine and mill were operated on a 4-day week schedule only. The ore produced on this schedule, however, greatly exceeded the demand, and it is probable that the mine and mill could have filled orders by operating on a 2-day week schedule. The Rosiclare Lead & Fluorspar Mining Co. thus provided work for about 200 employees, even though operating two instead of four days a week doubtless would have meant a considerable saving to the company.

The output of crude ore from the Daisy mine in 1930 amounted to 37,850 short tons, or 10 per cent less than in 1929, and that from the Eureka group amounted to 8,605 tons, or 39 per cent less than in 1929. The ore from both operations is treated in the Rosiclare mill. The Rosiclare mill treated 14 per cent less crude ore in 1930 than in 1929; the quantity of finished product, however, was only 9 per cent less, as the grade of crude ore mined and treated was higher in 1930. Of the total shipments from the Rosiclare mill in 1930, 70 per cent went to metallurgical, 23 per cent to ceramic, and 7 per cent to chemical industries. In addition, 1,420 short tons of mill tailings (fines) was shipped to the flotation mill of the Franklin Fluorspar Co. at Rosiclare. The tonnage of finished product recovered from the tailings, rather than the gross weight of the tailings, is included in the statistics for shipments of fluorspar. Most of the product from the Rosiclare mill in 1930 was shipped by rail to destination; however, a river loading station to provide for the shipping of fluorspar to its destination by the Ohio River serves the Rosiclare mill, and 27 per cent of the shipments in 1930 were by barge.

The Hillside mine near Rosiclare, Hardin County, is one of the important producers of fluorspar in the United States. Reeder[3] describes in detail the methods of exploration, prospecting, development, and mining. This mine is on the eastern extension of the Rosiclare vein, which in places attains considerable width; the maximum is 34 feet and widths of 18 to 20 feet are common, the average being about 12 feet. The main shaft is 6 by 20 feet inside measurement and contains four compartments; it is sunk in the footwall and is now 600 feet deep. The mine is worked from the 170, 250, 350, 450, and 550 foot levels. The mill which serves the mine is close to the main shaft, so that the ore hoisted can be dumped directly into the mill bin at the top of the headframe.

The Hillside mine was worked on a greatly reduced scale in 1930; the quantity of fluorspar milled was 26,665 short tons, or 23 per cent less than in 1929. The grade of ore milled was also somewhat lower in 1930, so that the quantity of finished product recovered decreased 26 per cent. Shipments from the mine in 1930 consisted chiefly of gravel fluorspar shipped to steel plants, but some fluorspar was shipped to foundries and some acid-grade lump fluorspar was sold for use in the manufacture of hydrofluoric acid. This mine, like its neighbor the Daisy mine, is served by a modern river-loading station, and barges on the Ohio River handled about one-fourth of the shipments. An illustrated article in the Iron Trade Review [4] describes the loading station of the Hillside mine.

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[3] Reeder, E. C., Methods and Costs of Mining Fluorspar at Rosiclare, Ill.: Inf. Circ. 6294, Bureau of Mines, July, 1930, 10 pp.

The mining operations of the Franklin Fluorspar Co. in Illinois were confined chiefly to the Hamp mine, 3 miles west of Karbers Ridge. This mine was operated to some extent until September; thereafter mining was discontinued.

The flotation mill of the Franklin Fluorspar Co. at Rosiclare, Ill., was operated on a greatly increased scale in 1930. A total of 16,460 short tons of fluorspar-bearing materials was treated in the mill, from which were recovered 6,173 tons of No. 1 concentrates suitable for use in the manufacture of hydrofluoric acid and 823 tons of No. 2 concentrates suitable for use in the manufacture of cement. Most of the fluorspar-bearing materials treated in the mill in 1930 were of Kentucky origin, and the concentrates recovered from the materials originating in Kentucky have been credited to Kentucky in the statistics.

The flotation mill was placed in commercial operation on March 18, 1929. Many years had previously been devoted to extensive studies and experiments with a view to finding a method whereby an acid-grade fluorspar could be recovered from fluorspar ores. The Bureau of Mines pointed the way to success in the flotation of fluorspar by doing the preliminary work at its Mississippi Valley Experiment Station, Rolla, Mo. Coghill and Greeman [5] have described the work of the Bureau of Mines.

The flotation of fluorspar ores is also the subject of United States Patent 1785992, issued December 23, 1930, to J. C. Williams and O. W. Greeman, assignors to the Aluminum Co. of America, of which the Franklin Fluorspar Co. is a subsidiary. According to this patent:

> * * * Fluorspar has a wide and varied application in the chemical, ceramic, and metallurgical industries as well as in others. The mineral serves various purposes, ranging from a source of fluorine in chemical processes to a fluxing material in the manufacture of steel, and consequently it is furnished to meet a number of varying specifications as to analysis. The highest grade of fluorspar material on the market is commercially known as acid grade spar and is furnished to meet a requirement of 98 per cent or more of calcium fluoride. This content of calcium fluoride or even a somewhat lower content is not found in much of the ore as mined and therefore suitable methods of concentrating the lower grade ores to a product containing 90 per cent or more of calcium fluoride are of considerable importance.
>
> * * * This invention relates to a method of froth-flotation whereby fluorspar values may be concentrated from fluorspar ores and similar fluorspar bearing material, containing substantial amounts of calcite.
>
> * * * In the preferred practice of our process we use oleic acid and cresylic acid, preferably in substantially equal quantities, as these reagents appear to be more effective, weight for weight, than are sodium oleate and phosphocresylic acid. However, the latter combination or a combination of sodium oleate and cresylic acid or oleic acid and phosphocresylic acid may be used with satisfactory results, and it is to be understood that in the claims appended hereto the terms "oleic acid" and "cresylic acid" include sodium oleate and phosphocresylic acid as their respective equivalents.
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> * * * The following examples of the manner in which our invention is preferably utilized are given.

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[4] Iron Trade Review, River Transportation Facilitates Distribution of Fluorspar: Vol. 85, Dec. 5, 1929, pp. 1443-1444.

[5] Coghill, W. H., and Greeman, O. W., Flotation of Fluorspar Ores for Acid Spar: Rept. of Investigations 2877, Bureau of Mines, June, 1928, 3 pp.

EXAMPLE 1

The original ore contained 21.5 per cent $CaCo_3$, 6 per cent SiO_2, and 70.8 per cent CaF_2. This ore, after reduction to about one-fourth inch size, was ground in a pebble mill to pass a 65-mesh screen. The ground ore was then mixed with suitable amounts of water and deslimed by repeated settling for 5-minute periods, the water and suspended material being siphoned off to within an inch of the ore after each 5-minute period. The deslimed pulp was placed in a laboratory flotation machine and 0.3 pound of oleic acid and 0.3 pound of cresylic acid per ton of pulp were added. The mixture was frothed for a suitable period and the froth, together with the material carried by it, was collected as it came over the lip of the cell. This froth was placed in another cell, diluted with water and without the addition of further reagents the pulp was again frothed. This operation was twice repeated and the froth from the final operation taken as the final concentrate.

In this run 24.5 per cent of the ore was removed as slimes. These carried 21.1 per cent of the original calcium fluoride content of the ore and 31.5 per cent of the original calcite content. The final concentrate analyzed 1.2 per cent $CaCO_3$, 0.15 per cent SiO_2, and 98.07 per cent CaF_2. The latter was 70.6 per cent of the original calcium fluoride content of the ore and about 90 per cent of the calcium fluoride content of the deslimed ore.

EXAMPLE 2

The ore contained 5 per cent $CaCO_3$, 9 per cent SiO_2, and 80.5 per cent CaF_2, and was deslimed as in Example 1. The ore, however, contained a certain amount of lead and zinc values and these were removed by a preliminary frothing with 0.15 pound of phosphocresylic acid per ton of pulp. The froth which came over the lip of the cell during this operation was eliminated from the process and the remaining pulp was frothed as in Example 1 with 0.25 pound of oleic acid and 0.15 pound of cresylic acid per ton. The froth from this operation was "cleaned" three times as in Example 1. In this example the desliming operation removed 27.9 per cent of the original weight of the ore as slimes. These slimes contained 26.4 per cent of the original calcium fluoride content of the ore and 43.3 per cent of the original calcite content. The final concentrate contained 0.43 per cent $CaCO_3$, 0.03 per cent SiO_2, and 99.27 per cent CaF_2. 74.5 per cent of the original content of the ore, or practically 100 per cent of the calcium fluoride content of the deslimed ore, was recovered in the concentrate.

EXAMPLE 3

The ore used contained 1.4 per cent $CaCO_3$, 35.8 per cent SiO_2, and 57.8 per cent CaF_2, and was deslimed, frothed, and the first froth cleaned as in Example 1. The reagents used in the first frothing operation were 0.25 pound of oleic acid and 0.25 pound of cresylic acid per ton of pulp. No reagents were used in the cleaning operation. In the desliming, 10.7 per cent of the original weight of the ore was removed as slimes. This slime contained 8.7 per cent of the original calcium fluoride content of the ore and 31.6 per cent of the original calcite content. The final concentrate analyzed 0.28 per cent $CaCO_3$, 0.17 per cent SiO_2, and 99.5 per cent CaF_2. The concentrate contained 83.3 per cent of the original calcium fluoride content of the ore and about 90 per cent of the calcite content of the deslimed ore.

It is to be understood that the above examples are given merely by way of illustration and that in its broader aspects the invention is not limited to the specific details described, but is defined by the appended claims. * * *

At the Victory mine in Hardin County 6 miles northwest of Cave in Rock production of fluorspar was practically at a standstill until August; consequently, the quantity mined and shipped in 1930 was substantially less than in 1929. All the fluorspar shipped in 1930 was of metallurgical grade. The Victory Fluorspar Mining Co. completed its loading station on the Ohio River at Cave in Rock, and 61 per cent of the shipments in 1930 were made by barge. The loading station consists of a 2,000-ton bin divided into three compartments, from which fluorspar is delivered to a floating tipple by means of a self-dumping 5-ton skip. This loading device is said to be unique.

Development work at the Victory mine has been in progress for several years. From the two ore bodies opened in 1927 by means of a shaft equipped with a headframe and ore bins, several thousand tons of fluorspar has been mined. West of this shaft another ore body was discovered in 1929 by diamond drilling, and a second shaft 192 feet deep was sunk in 1930; equipment at this shaft includes a headframe and two ore bins of 500 tons capacity. North of No. 1 shaft diamond drilling has located another ore body, which is near enough to the present underground workings to permit development by drifting into it. The mill which serves this mine consists of primary and secondary crushers, trommel and log washers, and a picking belt.

About 5 miles northwest of Cave in Rock and adjacent to the Victory mine is the Spar Mountain mine, opened late in 1918, from which 82,000 short tons of fluorspar has been shipped. Operations at the Spar Mountain mine in 1930 were on a greatly increased scale, the production of crude ore being 25,995 short tons, or 68 per cent more than in 1929. The grade of ore mined and treated in 1930 was virtually the same as in 1929. Serving this mine is a mill having a daily capacity of 150 tons and consisting of log and trommel washers, crushers, rolls, jigs, and tables. The tonnage shipped in 1930 was 29 per cent greater than in 1929; all was of fluxing grade except a small quantity of acid-grade lump fluorspar. The Spar Mountain mine was the largest shipper of fluorspar in the United States in 1930, and most of the fluorspar shipped went to its destination by the Ohio River. The fluorspar destined for shipment by barge is hauled to storage bins near the river, from which it is delivered to a loading station on the river. From time to time this mine yields some clear fluorspar suitable for optical instruments; 1,440 pounds of this material was sold in 1930.

Development work was continued during 1930 at the Crystal (formerly Austin) mine near Cave in Rock, in the course of which some fluorspar was mined and shipped. The fluorspar occurs in a blanket formation, as at the Spar Mountain and Victory mines. The mine is being developed by drifting; it is reported that an ore body averaging 8 feet in thickness and containing high-grade fluorspar was encountered 200 feet in the hillside.

The Eichorn mine (also known locally as the Baker mine) in Hardin County near Eichorn has been purchased by the Mid-West Fluorspar Co., of Golconda, Ill., which expects to open it during 1931. Considerable development was done at this mine from 1918 to 1922, during which time a 350-foot shaft was sunk, a total of about 300 feet of drifts was run at the 200-foot level, and a railroad switch to the mine was constructed. When operation was discontinued in 1922 a total of 371 short tons of fluorspar had been mined and sold.

The Mid-West Fluorspar Co. has also acquired by lease a property in Pope County at which a 150-foot shaft is being sunk, and a small mill consisting of a crusher, a washer, and a picking belt is being installed.

Production of fluorspar in 1930 at the Empire-Knight-Douglas group of mines in Pope County near Eichorn was considerably less than in 1929. Of the total shipped from these mines in 1930 about 31 per cent was acid-grade lump fluorspar, 59 per cent was fluxing-grade gravel fluorspar, and 10 per cent was foundry lump fluorspar.

A list of the producers of fluorspar in Illinois in 1930, with their post-office addresses, follows.

Producers of fluorspar in Illinois in 1930

Benzon Fluorspar Co	Cave in Rock, Ill.
Clement, R. B	Marion, Ky.
Crystal Fluorspar Co	Rosiclare, Ill.
Franklin Fluorspar Co	Pittsburgh, Pa.
Gipson, Mark	Elizabethtown, Ill.
Hillside Fluor Spar Mines	Chicago, Ill.
Knight, Knight & Clark	Rosiclare, Ill.
Rosiclare Lead & Fluorspar Mining Co	Cleveland, Ohio.
Victory Fluorspar Mining Co	Elizabethtown, Ill.

KENTUCKY

The principal fluorspar deposits in Kentucky are in Crittenden, Livingston, and Caldwell Counties in the western part of the State. Commercial deposits of fluorspar also occur in Mercer and Woodford Counties in central Kentucky, and from time to time these deposits have been the source of small and irregular production; no output has been reported since 1922.

The western Kentucky fluorspar field is just across the Ohio River from the important Illinois fluorspar district, and as these districts are both parts of a single distinctive province the same structural and mineralogic features are in general common to both. The bedded type of deposit which is characteristic of the Cave in Rock district in Illinois is not known to occur in the Kentucky field. In all other respects, however, the fluorspar deposits of western Kentucky resemble those of the adjoining Illinois field.

The greater part of the production of the State has come from Crittenden County, which contains not only the largest number of productive veins but the most important mines (past and present) in Kentucky. The Tabb vein system, on which are the Tabb, Wheatcroft, Haffaw, Pogue, Blue & Marble, Pigmy, and other mines, and the Columbia vein system, on which are the Franklin, Mary Belle, Ada Florence, Keystone, and other mines, are the most important veins in Crittenden County from the standpoint of past, present, and future production. Other mines of importance are widely scattered over many major and minor fault systems. Among such mines are the Lucile, Beard, Brown, Big Four, and Watson in Crittenden County; the Bonanza, Guill, Klondike, and Nancy Hanks in Livingston County; and the Crook, Crider, and Marble in Caldwell County.

In 1930 fluorspar-bearing rock equivalent to about 52,000 short tons of merchantable fluorspar was mined from 35 mines or prospects in Kentucky; shipments of fluorspar from Kentucky to consumers amounted to 39,181 short tons, a decrease of 45 per cent from 1929. The shipments of fluorspar from Kentucky in 1929 and 1930 were distributed among the industries as follows:

Distribution among the various industries of fluorspar from Kentucky, 1929 and 1930, in short tons

Industry	1929	1930
Steel	52,952	27,321
Foundry	1,439	587
Glass	3,433	1,843
Enamel	2,136	923
Hydrofluoric acid	9,411	7,116
Portland cement	911	954
Miscellaneous	60	225
	70,342	38,969
Exported	485	212
	70,827	39,181

Caldwell County.—In Caldwell County, where the deposits of fluorspar occur east and southeast of Fredonia and north and northwest of Princeton, mining was on a greatly reduced scale in 1930.

The chief producing mines in Caldwell County in 1930 were those of the S. L. Crook Corporation near Crider. In addition to continuing operations at the mines worked in 1929 this corporation mined a considerable quantity of fluorspar from a newly opened property about 10 miles from Crider. The mines operated by this corporation are 3 to 10 miles from Crider. The crude ore from the mines is hauled to the mill at Crider, where it is prepared for the market. All the fluorspar recovered in 1930 was of fluxing grade, and practically all of it was shipped to steel plants.

At the Walker mine 3 miles north of Crider development and production were continued in 1930; 1,100 short tons of crude fluorspar was mined. The sales of fluorspar in 1930 consisted of 107 tons of high-grape lump fluorspar and 319 tons of log-washed gravel fluorspar. On November 20, 1930, the mine was acquired by the Cleveland Exploration Co., of Cleveland, Ohio.

Both the Senator mine, 5 miles northwest of Princeton, and the Eureka mine, 3½ miles from Crider, were worked on a small scale during 1930; some fluorspar was mined and sold to local mills.

Crittenden County.—During the first half of 1930 the Franklin Fluorspar Co. worked the Mary Belle, Brown, Hodge, Memphis, Susie Beeler, Beard, Cross, and Franklin mines, 5 to 15 miles from Marion, Ky., to some extent. The company also purchased some of the output of many local mines, chiefly the Watson, Guill, Pepper Box, Holly, Blue & Marble, and Davenport. The company has a well-equipped mill at Marion, where the ore from its Kentucky mines and most of that purchased are prepared for the market. Operations at the company's mines and mill in Kentucky were discontinued in June, 1930. Shipments from the mill of the company in Kentucky were 70 per cent less in 1930 than in 1929. About one-fifth of the total shipped in 1930 was acid-grade fluorspar.

The Watson (or Liberty Bond) mine, 7 miles southwest of Marion, was worked about 10 months during 1930, producing 4,556 short tons of crude fluorspar or 72 per cent more than was mined in 1929. Sales, however, were only 46 per cent greater than in 1929. The crude ore from this mine is treated in a mill consisting of a crusher, a log washer, conveyors, jigs, and tables; of the product recovered from the ore treated in 1930, 47 per cent was acid grade and 53 per cent was fluxing grade.

At the Lucile mine (a short distance south of the railroad station at Marion) 4,350 short tons of crude fluorspar was mined and treated in 1930, or about 18 per cent less than in 1929. The quantity of finished product recovered, however, was about 32 per cent greater than in 1929, indicating that a much higher grade of ore was mined in 1930. Shipments in 1930 consisted of 3,542 tons of fluxing grade fluorspar and 169 tons of mill tailings. The ore is prepared for the market in the Kentucky mill, only a short distance south of the Lucile mine.

The mines of the Lafayette Fluorspar Co. near Mexico, Ky., were worked throughout the year, and the mill was run at maximum capacity. Shipments of fluorspar, however, were curtailed, being only about half of those in 1929. During 1930 development and mining progressed on and above the 250-foot level in Tabb No. 1 mine; the 250-foot level was extended eastward to an unmined ore body and shrinkage stopes in the principal ore bodies were completed. Stoping was continued in the west Wheatcroft ore body above the 200-foot level, and drifting on the west 250-foot level of Tabb No. 1 mine was extended to undercut the Wheatcroft ore bodies. The shaft at Tabb No. 1 mine was deepened to the 400-foot level, where a crosscut to the vein and a development drift on the vein have been driven. A pump station and other equipment are being installed at the 400-foot level. Mining of shallow surface fluorspar left in old workings by former operators was undertaken through five small shafts, and a considerable tonnage is being recovered. The Lafayette mill was enlarged further to accommodate a second Hancock jig with accessory elevators and screens, adding about 50 per cent to the mill capacity. During the year the Kentucky Utility Power Co. line was extended to the property of the Lafayette Fluorspar Co., and a change from company steam generator power to Kentucky Utility power was made early in November.

The Kentucky Fluor Spar Co., which has a mill a short distance south of the station at Marion and adjoining the Lucile mine, did 60 per cent less business by volume than in 1929; fluxing grades comprised 28 per cent, ground fluorspar 68 per cent, and tailings 4 per cent of the sales in 1930. This company does not operate any mines but buys part or all of the output of many local mines and prospects. In 1930 the company obtained its supply chiefly from the Nancy Hanks, Davenport, Lucile, Keystone, Watson, Pogue, Guill, and Peyton mines. The company took advantage of slack business to overhaul completely its mill, which comprises both jigging and grinding units. The jigging unit consists of 1 crusher, 1 set of rolls, 3 elevators, 2 sets of jigs, 1 table, 1 classifier, 5 pumps, and other accessory equipment. The grinding unit consists of 1 drier, 1 grinder, 3 elevators, 4 conveyors, 1 packer, and other necessary equipment. To give fairly steady work to its employees the company operated these units alternately during 1930 instead of simultaneously, as is the usual custom.

The Holly mine, 10 miles west of Marion, was operated on a greatly increased scale in 1930, producing 4,024 short tons of log-washed fluorspar, compared with 2,925 tons in 1929. All the output in 1930 was sold to the Franklin mill at Marion.

In 1930, as in several previous years, the entire output of the Davenport mine 8 miles from Marion was sold to local mills. The output in 1930 amounted to 1,100 short tons of crude ore, from which 750 tons of log-washed fluorspar was recovered, compared with 2,000 tons mined and 1,247 tons recovered in 1929. The Davenport mine was leased in 1922 for 20 years by the Independent Fluorspar Co.; the company opened it in 1924, and since that time the mine has been a fairly constant producer. In December, 1930, the mine was subleased to the National Fluorspar Co., which, it is reported, plans development on an extensive scale.

At the Pepper Box mine, 9 miles from Marion, which was opened in 1929, development was continued during 1930; a promising ore body was disclosed, from which crude ore was mined yielding 1,108 short tons of log-washed fluorspar.

After April 1, 1930, mining operations were suspended at the Keystone mine 5 miles west of Marion, at which development had been under way since 1928. The production of crude ore in 1930 amounted to 1,260 short tons, of which 563 tons was shipped to the company's mill at Rosiclare, Ill., 245 tons was sold to local mills, and the remainder was held in stock at the mine.

Production at the Blue & Marble mine 1 mile south of Mexico, Ky., amounted to 4,144 short tons of fluorspar concentrates and 821 short tons of lump fluorspar. The entire production was sold to fluorspar mills at Marion and Mexico, Ky., and Rosiclare, Ill.

At the properties of the Pope Mining Co. a few hundred tons of fluorspar was produced from two shafts 5 and 6 miles, respectively, from Marion; prospecting was done at the Sullinger prospect, 7 miles from Marion; and 45 tons of fluorspar was salvaged from an old dump at the Two Brothers mine, 10 miles southwest of Marion.

Fluorspar was mined during 1930 at several other mines and prospects in Crittenden County, in quantities ranging from a few tons to 800 tons. Such properties include the Edwards, Butler, Hayshed, Crittenden Springs, Reiter, and Pogue.

Livingston County.—In Livingston County six mines or prospects were worked in 1930; they produced about 19,000 short tons of crude fluorspar compared with about 19,700 tons in 1929.

The chief producer in the county in 1930 was the Klondike mine, 6 miles southwest of Salem and 7 miles northeast of Smithland. This mine produced 15,000 short tons of run-of-mine ore in 1930, from which 8,360 tons of gravel fluorspar of fluxing grade was recovered. Only 5,605 tons of the ore produced in 1930 was shipped; 3,500 tons went to its destination by the Ohio River. The concentrating mill serving this mine consists of 4 jigs, 2 tables, and 1 crusher, and rolls, screens, and other necessary equipment.

The Guill mine, 1½ miles north of Salem, was worked about 10 months during 1930 and produced 2,434 tons of crude ore, compared with 3,113 tons in 1929. The ore from this mine is log-washed, and a large part of the resultant product is suitable for use in the manufacture of hydrofluoric acid. Sales in 1930 were 29 per cent less than those in 1929; 68 per cent was fluxing grade and 32 per cent was acid grade.

The Nancy Hanks mine, 1½ miles southeast of Salem and 13 miles southwest of Marion, produced 1,139 short tons of fluorspar in 1930; all of it was sold to the Kentucky mill at Marion.

The Peyton, Riley, and Damron prospects in Livingston County produced small quantities of fluorspar in 1930, all of which was sold to local mills.

The list that follows contains the names and addresses of the chief operators of fluorspar mines or mills in Kentucky in 1930.

Operators of chief fluorspar mines or mills in Kentucky in 1930

Crook Corporation, S. L	Princeton, Ky.
Eagle Fluor Spar Co	Salem, Ky.
Franklin Fluorspar Co	Pittsburgh, Pa.
Fredonia Fluorspar Co	Princeton, Ky.
Gugenheim Mining Co	Marion, Ky.
Haynes, W. V	Do.
Henry & Frazer	Do.
Hillside Fluor Spar Mines	Chicago, Ill.
Holly Fluorspar Co	Marion, Ky.
Independent Fluorspar Co	Do.
Kentucky Fluor Spar Co	Do.
Klondike Fluorspar Corporation	Mullikin, Ky.
Lafayette Fluorspar Co	Duluth, Minn.
Lynch, R. A	Marion, Ky.
McMaster & Hunter	Mexico, Ky.
National Fluorspar Co	Marion, Ky.
Pope Mining Co	Louisville, Ky.
Wallace Fluorspar Co	Sturgis, Ky.
Zinc & Spar Co	Salem, Ky.

NEVADA

The Daisy mine, 4½ miles southeast of Beatty in Nye County, was worked continuously in 1930, and 877 short tons of fluorspar of gravel size was shipped to steel plants on the Pacific coast; shipments from this mine in 1929 amounted to 757 tons. Development during 1930 resulted in the finding of enough new ore to permit of more than doubling the production. To keep pace with the increased production the loading facilities at Beatty, the shipping point, have also been doubled.

The Baxter mine, 5½ miles from Broken Hills in Mineral County, was worked by the Fluorite Producers until April 30; about 150 feet of drifting was done at the 100-foot level and 97 tons of fluorspar was shipped to steel plants on the Pacific coast. The mine was returned on December 5, 1930, to the owner, V. S. Baxter, of Broken Hills, Nev. A serious handicap to large-scale production at this property is the distance of about 75 miles to Fallon, the railroad shipping point.

Producers of fluorspar in Nevada in 1930

Crowell, J. Irving, jr	Beatty, Nev.
Fluorite Producers	Stockton, Calif.

NEW MEXICO

Production of fluorspar in New Mexico was first recorded in 1909, when 710 short tons was shipped from the Sadler mine, near Deming, in Luna County. Through 1917 this county was the only source of production of fluorspar in the State; in 1918 the initial shipments were made from deposits in Grant and Dona Ana Counties; in 1919 the first shipments were recorded from deposits in Sierra County; and in 1926 a small carload of fluorspar was shipped from a deposit in Socorro County. The shipments from New Mexico from 1909 to 1930, inclusive, amounted to 55,235 short tons; of this total Dona Ana County contributed about 42 per cent, Luna County 31 per cent, Grant County 13 per cent, and Sierra County 14 per cent.

Shipments of fluorspar from New Mexico in 1930 amounted to 2,312 tons, compared with 2,438 tons in 1929. Of the 1930 total 2,188 tons was for use in steel plants and 124 tons for use in foundries.

The greater part of the fluorspar mined in New Mexico in 1930 was obtained near Las Cruces, Dona Ana County. The ore was hauled to the Tortugas mill near Mesilla Park, where it was prepared for the market. Practically all the fluorspar from this mill in 1930 was shipped for use in steel plants.

The Hot Springs mine, 4½ miles south of Hot Springs, Sierra County, was worked during 1930, although inactive in 1929. Most of the fluorspar shipped in 1930 went to the steel plant at Pueblo, Colo., but a little was shipped for milling at Mesilla Park, N. Mex. The fluorspar shipped to the steel plant was run-of-mine material and was reported to have contained less than 85 per cent of calcium fluoride and more than 5 per cent of silica. The product from this mine is hauled 25 miles to Engle, N. Mex., the shipping point.

In 1930 some fluorspar was mined at a deposit near the Nakaye mine, about 5 miles north of Derry, Sierra County. The fluorspar from this deposit was hauled 16 miles to Hatch, the shipping point; most of it was shipped to the steel plant at Pueblo, Colo., and the remainder was shipped to consumers on the Pacific coast.

Some fluorspar was mined and shipped in 1930 from the Sadler mine in Luna County, 8 miles north of Nutt, and a carload was mined and shipped from the Cox prospect in Sierra County, 15 miles from Cutter.

Producers of fluorspar in New Mexico in 1930 were as follows:

Producers of fluorspar in New Mexico in 1930

Cox & Cox	Las Palomas, N. Mex.
Hayner & Manasse	Las Cruces, N. Mex.
Velie Metals Co	El Paso, Tex.

STOCKS AT MINES OR SHIPPING POINTS

According to the reports of producers the total quantity of fluorspar in stock at mines or shipping points at the close of 1930 was 109,190 short tons, an increase of 48 per cent over 1929. These stocks consisted of 52,714 tons of crude fluorspar calculated to be equivalent to 26,000 tons of ready-to-ship fluorspar and of 56,476 tons of ready-to-ship fluorspar. As the quantity of fluorspar in stock piles must be partly estimated the mine reports vary from year to year, preventing absolute balance between the quantity mined and that shipped and in stock.

Stocks of fluorspar at mines or shipping points in the United States, 1929 and 1930, by States, in short tons

State	1929			1930		
	Crude[1]	Ready-to-ship	Total	Crude[1]	Ready-to-ship	Total
Arizona	150	225	375	150	225	375
Colorado	265	40	305	205	40	245
Illinois	6, 945	12, 540	19, 485	7, 624	32, 632	40, 256
Kentucky	47, 205	5, 143	52, 348	43, 412	23, 499	66, 911
Nevada	60	100	160	175		175
New Mexico	1, 100	80	1, 180	1, 100	80	1, 180
Texas	48		48	48		48
	55, 773	18, 128	73, 901	52, 714	56, 476	109, 190

[1] The greater part of this crude (run-of-mine) fluorspar must be beneficiated before it can be marketed.

IMPORTS AND EXPORTS [6]

The total imports of fluorspar into the United States in 1930 amounted to 64,903 short tons, valued[7] at $544,656, the third largest on record and an increase of 19 per cent in quantity and 13 per cent in total value over 1929. The value assigned to the foreign fluorspar averaged $8.39 a ton. The cost to consumers in the United States includes, in addition, the duty, loading charges at the docks, ocean freight, and other charges, besides the freight from docks to manufacturers' plants.

The imports were equivalent to 68 per cent of the total shipments of domestic fluorspar in 1930, compared with 37 per cent in 1929.

As is shown in the next table and is well known in the industry the greater part of the imported fluorspar is sold for use in the steel industry. According to reports by importers to the Bureau of Mines the selling price at tidewater, duty paid, of the imported fluorspar sold to steel manufacturers averaged $17.52 a short ton in 1930; the selling price at tidewater, duty paid, of imported ground fluorspar, sold to manufacturers of glass and enamel, averaged $34.93 a short ton.

The following table was compiled chiefly from data courteously furnished the Bureau of Mines by importers; it shows the distribution of the fluorspar imported into the United States in 1930.

Distribution of fluorspar imported into the United States in 1930

[Distribution partly estimated by Bureau of Mines]

Industry	Short tons	Selling price at tidewater, including duty	
		Total	Average
Steel	51,758	$906,622	$17.52
Foundry	955	17,429	18.25
Glass	2,981	102,746	34.47
Enamel	647	23,976	37.06
Hydrofluoric acid	3,643	100,600	27.61
Cement	56	1,114	19.89
	60,040	1,152,487	19.20
Undistributed	2,969	(1)	(1)
Unsold	1,894		
	64,903		

[1] Data not available.

Germany was the chief source of imported fluorspar in 1930, supplying 23,797 short tons, compared with 16,488 tons in 1929, an increase of 44 per cent. The imports of fluorspar from Germany in 1930 were distributed among the various industries as follows:

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[6] Figures on imports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce; those on exports supplied by the producers. No exports of fluorspar recorded by the Bureau of Foreign and Domestic Commerce.

[7] "The value of imported merchandise * * * is the foreign value or the export value, whichever is higher—that is, the market value or the price at which the merchandise, at the time of exportation to the United States, is offered for sale in the principal markets of the country from which exported, including the cost of containers or coverings and all expenses (including any export tax) incident to placing the merchandise in condition ready for shipment to the United States, as defined in section 402 of the tariff act of 1922."

Distribution among the various industries of fluorspar imported from Germany in 1930

Industry:	Short ton
Steel	18, 774
Foundry	925
Glass and enamel	1, 828
Hydrofluoric acid	845
Cement	56
Undistributed	205
Unsold	1, 164
	23, 797

France was the second largest source of imported fluorspar in 1930, supplying 23,313 short tons, compared with 16,850 tons in 1929, an increase of 38 per cent. Practically the entire importation from France in 1930 was sold for use in steel plants.

Imports from the United Kingdom in 1930 amounted to 5,756 short tons, compared with 4,828 tons in 1929, an increase of 19 per cent. Practically all the fluorspar from this source in 1930 was sold for use in steel plants.

Imports of fluorspar from Spain in 1930 were 6,784 short tons, compared with 7,168 tons in 1929, a decrease of 5 per cent. Practically the entire importation from Spain in 1930 was sold for use in steel plants.

Imports of fluorspar from Italy in 1930 were 1,802 short tons, compared with 1,258 tons in 1929, an increase of 43 per cent. All the fluorspar imported from this source in 1930 was ground and was sold for use in the glass industry.

Imports from Africa, the chief source of foreign acid-grade fluorspar since 1923, decreased 58 per cent in 1930; imports from this source were 2,712 short tons in 1930, compared with 6,387 tons in 1929. Some notes on the fluorspar deposits of South Africa are given on pages 41 to 42.

Imports of fluorspar from China in 1930 were 739 short tons, compared with 1,345 tons in 1929, a decrease of 45 per cent. Practically all the fluorspar imported from China is sold to steel manufacturers on the Pacific coast.

The rate of duty on fluorspar that contains 93 to 97 per cent of calcium fluoride was increased, effective June 18, 1930, from $5.60 per long ton ($5 per short ton) to $8.40 per long ton ($7.50 per short ton). Thus, under the revised tariff, effective June 18, 1930, the rate of duty on fluorspar containing not more than 97 per cent of calcium fluoride is $7.50 per short ton, and the rate of duty on fluorspar containing above 97 per cent of calcium fluoride is $5 per short ton.

The distances that domestic fluorspar must be transported by rail from mines to steel plants in the Lehigh and Susquehanna Valleys of Pennsylvania are much greater than the distances that foreign fluorspar must be moved from the ports of entry to these plants, so that comparatively little domestic fluorspar is sold to steel plants in this district. Moreover, a large part of the imported material is carried as ballast, making possible a lower market price than would have to be charged if it were carried as a primary cargo. As the value of fluorspar depends mainly upon its purity, however, comparison of American with foreign fluorspar should be made not merely on the basis of price per ton but on quality as well.

Fluorspar imported into the United States, 1929 and 1930, by countries

[General imports]

Country	1929		1930	
	Short tons	Value	Short tons	Value
Africa: British—				
South	5, 106	$59, 014	2, 712	$31, 069
Other	1, 281	16, 842		
Belgium	21	519		
China	1, 345	11, 534	739	7, 957
France	16, 850	159, 059	23, 313	184, 238
Germany	16, 488	$140, 860	23, 797	$189, 587
Italy	1, 258	10, 528	1, 802	17, 198
Spain	7, 168	52, 039	6, 784	53, 612
United Kingdom.	4, 828	30, 580	5, 756	60, 995
	54, 345	480, 975	64, 903	544, 656

Fluorspar imported into the United States in 1930, by countries and districts

[General imports]

Country	District	Containing above 97 per cent of calcium fluoride		Containing not more than 97 per cent of calcium fluoride	
		Short tons	Value	Short tons	Value
Africa: British South	Maryland	209	$2, 463		
	Philadelphia	1, 937	22, 535	566	$6, 071
		2, 146	24, 998	566	6, 071
China	do	13	320		
	San Francisco	409	3, 741		
	Washington	317	3, 896		
		739	7, 957		
France	Buffalo	1, 792	16, 429	3, 640	25, 002
	Maryland	1, 512	14, 064	3, 360	30, 900
	New York	1, 400	9, 177	4, 894	32, 913
	Philadelphia	218	2, 457	6, 497	53, 296
		4, 922	42, 127	18, 391	142, 111
Germany	Buffalo			1, 128	12, 580
	Los Angeles	59	1, 553	458	2, 877
	Maryland	11, 682	86, 957	6, 211	44, 277
	Massachusetts			213	2, 367
	New York	84	1, 988		
	Philadelphia	1, 900	21, 166	1, 616	12, 469
	Washington	110	1, 225	336	2, 128
		13, 835	112, 889	9, 962	76, 698
Italy	Maryland			176	1, 431
	New York			87	715
	Philadelphia	911	7, 409	628	7, 643
		911	7, 409	891	9, 789
Spain	Buffalo			2, 679	23, 171
	New York	37	243	800	4, 692
	Philadelphia	522	6, 493	2, 746	19, 013
		559	6, 736	6, 225	46, 876
United Kingdom	Buffalo			1, 351	14, 890
	Maryland			2, 426	22, 179
	Ohio			1, 529	21, 664
	Philadelphia			450	2, 262
				5, 756	60, 995
		23, 112	202, 116	41, 791	342, 540

Fluorspar imported into the United States, 1921–1930, by countries

[General imports]

Year	Africa		Canada		France		Germany		Italy	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1921	--------	--------	4,370	$52,855	--------	--------	215	$4,420	--------	--------
1922	486	$8,415	2,877	32,679	--------	--------	5,804	49,196	--------	--------
1923	10,380	157,625	(1)	5	--------	--------	8,580	67,595	268	$2,471
1924	11,125	147,977	213	3,216	232	$2,782	6,834	69,357	1,585	14,804
1925	7,906	108,647	--------	--------	2,537	20,887	11,680	103,845	4,278	32,208
1926	8,506	136,502	1,109	10,310	11,163	90,737	20,465	171,769	1,379	15,434
1927	7,069	90,966	560	4,250	11,711	86,279	31,829	230,821	449	5,969
1928	2,661	36,471	--------	--------	15,072	141,434	17,601	150,872	1,033	9,600
1929	6,387	75,856	--------	--------	16,850	159,059	16,488	140,860	1,258	10,528
1930	2,712	31,069	--------	--------	23,313	184,238	23,797	189,587	1,802	17,198

Year	Spain		United Kingdom		All other		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1921	--------	--------	1,644	$12,031	--------	--------	6,229	$69,306
1922	--------	--------	23,836	206,950	105	$1,948	33,108	299,188
1923	--------	--------	22,862	202,548	136	2,075	42,226	432,319
1924	--------	--------	29,365	298,391	1,689	19,115	51,043	555,642
1925	--------	--------	21,635	195,229	664	8,031	48,700	468,847
1926	2,948	$33,915	29,407	281,735	694	6,835	75,671	747,237
1927	978	3,650	18,449	168,840	470	4,410	71,515	595,185
1928	680	5,178	9,360	56,585	776	8,560	47,183	408,700
1929	7,168	52,039	4,828	30,580	1,366	12,053	54,345	480,975
1930	6,784	53,612	5,756	60,995	739	7,957	64,903	544,656

[1] Quantity not recorded.

Producers of fluorspar reported exports in 1930 amounting to 281 short tons, valued at $6,160, or $21.92 a ton, compared with 506 tons, valued at $11,621, or $22.97 a ton, in 1929. All the fluorspar exported in 1929 and 1930 went to Canada.

Fluorspar reported by producers as exported from the United States, 1921–1930 [1]

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average			Total	Average
1922	2,296	$40,966	$17.84	1927	385	$7,507	$19.50
1923	1,144	25,312	22.13	1928	398	6,586	16.55
1924	617	14,489	23.48	1929	506	11,621	22.97
1925	1,055	17,574	16.66	1930	281	6,160	21.92
1926	2,132	34,915	16.38				

[1] No fluorspar reported by producers as exported in 1921.

USES

The uses of and specifications for fluorspar are discussed in greater detail in Mineral Resources, 1926, Part II, pages 30 to 34.

Metallurgical industries.—Fluorspar has many uses, but the most important is in the manufacture of steel by the basic open-hearth process. It is also used in the manufacture of alloy steel and ferroalloys by the electric-furnace process and in some foundry and other metallurgical operations.

Ceramic industries.—Considerable quantities of fluorspar are used in the glass industry, chiefly for the manufacture of opal or opaque and colored glass; as an ingredient in enamels for various purposes; and in the manufacture of cement, in which it is said that the addition of fluorspar to the raw materials permits the lowering of the fusing point, resulting in considerable economy in fuel as well as power, because the clinker obtained is fragile and therefore more easily ground.

Chemical industries.—Fluorspar is the basic material in the manufacture of hydrofluoric acid. It is also said to be used to facilitate the fusion and contact of ingredients in the manufacture of calcium carbide and cyanamid.

Optical fluorspar.—A very small quantity of clear fluorspar crystals is used for optical purposes; fluorspar is useful in correcting the color and spherical aberration errors in lenses, especially those of microscopes and small telescopes.

CONSUMPTION—STOCKS AT CONSUMERS' PLANTS

Figures on the consumption of fluorspar in 1929 and 1930 and on stocks at consumers' plants at the close of these years are given in the following table. Although these figures do not include data from all consumers it is believed that they do not fall far short of the total for the United States. Thus, in 1930 the figures for the basic open-hearth steel industry, the chief consumer of fluorspar, include actual figures from the 60 companies that make 99.5 per cent of the total basic open-hearth steel and estimates for the other 3 companies. Consumption by all electric steel and ferro-alloy manufacturers who are known to use fluorspar is represented. The smaller foundries, some of which use a little fluorspar, are not all represented, so that data on the consumption and stocks for this industry are somewhat incomplete. The figures for fluorspar used in hydrofluoric acid for 1930 represent actual figures for four companies and an estimate for one company. The consumption and stocks for the glass and enamel industries represent 105 companies in 1930 and are believed to be practically complete, as these companies include all the larger and probably most of the smaller consumers.

Fluorspar consumed and in stock in the United States, 1929 and 1930, by industries, in short tons

Industry	1929		1930	
	Consumption	Stocks at consumers' plants Dec. 31	Consumption	Stocks at consumers' plants Dec. 31
Basic open-hearth steel	[1] 155,600	[1] 70,700	109,000	89,000
Electric furnace steel	6,500	1,100	3,600	1,000
Foundry	2,700	700	1,600	800
Ferro-alloys	1,100	200	1,100	300
Hydrofluoric acid and derivatives	15,600	14,000	12,600	15,000
Enamel and vitrolite	5,200	700	4,000	600
Glass	6,600	1,000	4,300	1,000
Miscellaneous	1,500	600	2,000	600
	[1] 194,800	[1] 89,000	138,200	108,300

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[1] Revised figures.

The average quantity of fluorspar used by individual plants per ton of basic open-hearth steel made varies widely, usually ranging from 1 to 50 pounds. In general, the average is 5 to 8 pounds—a very small proportion of the furnace charge. The next table shows over a period of five years the variation in average consumption of fluorspar per ton of basic open-hearth steel in certain plants that make about 88 per cent of the total.

Average consumption of fluorspar per ton of steel, 1926–1930, in pounds

1926	1927	1928	1929	1930
12.959	13.315	12.211	14.727	16.931
8.219	7.074	6.761	6.043	6.559
5.700	6.100	5.640	4.825	4.768
6.270	7.067	6.253	6.674	6.544
4.313	4.862	4.181	3.815	2.545
8.541	8.572	8.204	7.215	5.661
4.862	4.561	5.875	6.237	5.555
6.692	6.320	7.648	7.344	7.705
4.289	4.487	6.156	5.822	6.276
8.440	11.509	10.766	10.470	10.651
4.348	10.033	6.953	5.569	5.311
13.103	12.850	12.261	11.510	9.720
6.089	4.842	5.272	6.589	6.118
3.460	4.822	5.988	7.880	6.606
8.442	7.219	6.906	6.622	7.087

The table that follows shows the relation of the consumption of fluorspar to the production of basic open-hearth steel for the five years from 1926 to 1930 and the stocks of fluorspar at such plants at the close of each of these years.

Consumption and stocks of fluorspar at basic open-hearth steel plants, 1926–1930

	1926	1927	1928	1929	1930
Production of basic open-hearth steel ....long tons..	39,653,315	37,144,268	43,200,483	47,232,419	34,268,316
Consumption of fluorspar in basic open-hearth steel production......short tons..	142,000	138,000	152,000	[1] 155,600	109,000
Consumption of fluorspar per ton of steel made........pounds..	7.2	7.4	7.0	6.6	6.3
Stocks of fluorspar on hand at steel plants at end of year........short tons..	70,000	85,000	76,000	[1] 70,700	89,000

[1] Revised figures.

CONSUMERS

A directory of consumers of fluorspar in the United States, classified according to the industries in which the mineral is used and each industry arranged alphabetically by States and by location of consuming plant, is given in Mineral Resources, 1926, Part II, pages 38 to 45. The marketing of and markets for fluorspar are discussed in Mineral Resources, 1926, Part II, pages 35 to 38.

FLUORSPAR IN FOREIGN COUNTRIES

CANADA[8]

The production of fluorspar in Canada in 1930 was 80 short tons, valued at $1,240, and came from a deposit near Madoc, Ontario. The production in 1929 was 17,870 tons, valued at $268,120, of which 17,800 tons was contributed by the Rock Candy mine in British Columbia and 70 tons was mined near Madoc, Ontario.

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[8] Dominion Bureau of Statistics, Preliminary Report of the Mineral Production of Canada during the Calendar Year 1930: Ottawa, 1931, p. 25.

Imports of fluorspar into Canada in 1930 amounted to 12,652 short tons, valued at $160,995, compared with 12,092 tons, valued at $159,798, in 1929.

The fluorspar deposits of Canada are the subject of a report published in 1929 by the Canada Department of Mines.[9]

FRANCE [10]

Producers of fluorspar in France exported only small tonnages of this mineral prior to 1926. Since the crude methods of mining have been abandoned the producers have grouped a certain number of deposits with a view to exporting the mineral, and if all have not succeeded in this aim they have at least created a domestic market that is much more active than formerly. The most important deposits in France are in the Central Massif, in the Lyonnais district, in Provence, and in the east.

The following statement shows the production of fluorspar in the most important districts in 1929.

Fluorspar produced in the most important districts of France in 1929

	Metric tons		Metric tons
Var	26, 000	Rhone	2, 500
Puy-de-Dome	5, 300	Saone-et-Loire	7, 000
Nievre	350	Indre	850
Haute-Loire	1, 000	Aveyron-Lozere	3, 500

If to the above production is added the output of a few workings in the east and several others of small importance, the total production of fluorspar in France in 1929 may be estimated as 55,000 metric tons.

The Esterel district furnishes the largest tonnage of fluorspar; also, on account of the favorable geographical location of the deposits, this district furnishes almost all the fluorspar exported to the United States.

French fluorspar is characterized by its purity. A content of 93 per cent CaF_2 is common, and large quantities are shipped to the chemical industry. Thus, in the Puy-de-Dome district the underground quarries, situated near Herment and worked by the Établissements Teisset Kessler, ship to chemical plants two-thirds of their annual production which amounts to about 5,000 metric tons. In the same district, at Saint-Jacques d'Ambure, the Société Alais Froges Camargue quarries the fluorspar for its own plant, which is near Gouttenoire's quarry. The production of fluorspar from the latter quarry is also used by the chemical industry.

In Saone-et-Loire, in the east, in Var, and in Indre an important quantity of fluorspar, containing 85 to 89 per cent of calcium fluoride, is shipped for use in metallurgical plants.

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[9] Wilson, M. E., Fluorspar Deposits of Canada: Canada Dept. of Mines, Econ. Geol. Series 6, Ottawa, 1929, 97 pp.

[10] Echo des Mines et de la Métallurgie, Oct. 20, 1930, pp. 879-881.

SOUTH AFRICA

Fluorspar was first mined in the Union of South Africa in 1918, when the production was valued at £380 ($1,849). No data are available showing the quantity of fluorspar produced before 1923 but the production, except in 1920, appears to have been small. The peak production was recorded in 1923, when 12,098 short tons was produced. Since 1923 the production has declined more or less steadily to 2,993 tons in 1929. According to Abbey,[11]

> Practically all of the fluorspar deposits are located in the western Transvaal in the Marico district. The deposits are near the town of Zeerust which has very good railway connection with the coast, through the junction town of Mafeking. The area can be roughly divided into two areas topograhically, that is, the southern end, which is flat or else slightly undulating and which is a part of the dolomite series of the Transvaal system, and the northern portion, which lies at the contact of the dolomite series and the Pretoria series.
>
> The fluorspar occurs principally on the farms Malmani Oog, Witkop, and Buffelshoek. There are also deposits on the farms Strydfontein, Rhenosterfontein, Kaalplats, and Naauwpoort in the same vicinity. Practically all of the fluorspar taken out to date has been from Malmani Oog and Buffelshoek.
>
> The surface deposit is large calcareous tufa of the sheet limestone variety with certain occurrences of Vlei limestone. There are also deep gravel deposits composed of chert pebbles and some ferruginous nodules.
>
> The general geological structure is typical of the Transvaal and Pretoria series. This is made up chiefly of dolomite and chert, in some places the massive white chert being 30 feet thick. Although dolomite rock is ordinarily normal, there is a considerable siliceous infiltration resulting from quartz formation as a metasomatic replacement of dolomite.
>
> There are two general types of fluorspar occurrences in the western Transvaal deposits, that is, gash veins and impregnations of the dolomite and large bodies of practically pure fluorspar.
>
> The first type is very common throughout the district. Sometimes calcite and talc are mingled with the fluorspar but generally speaking it occurs by itself. The veins are from 1 inch to over a foot in width, which cut through the dolomite and sometimes even through the chert. There is apparently no regulation by bedding planes, although most of the veins transverse the bedding. In some cases there are scattered crystal patches in the dolomite and again there is more fluorspar than dolomite. Where weathering has taken place, the dolomite has been completely eroded and masses of fluorspar only remain. This residue is ordinarily very dark brown or black, having been stained by the manganese oxides and residual iron present in the dolomite.
>
> While occurrences of the first type are very general, they have produced very little fluorspar to date, as they are too irregular and no one deposit is of any great volume. Furthermore, margins of profit are very small and the cost of production is prohibitive on anything less than 98 per cent [of CaF_2] with less than 1 per cent silica.
>
> The second type is the massive deposit of pure fluorspar which is chiefly concentrated on the farms Malmani Oog and Buffelshoek, with some on Witkop. These are now largely depleted in mass.
>
> The main deposit on Malmani Oog is roughly oval in shape with the axis running almost due east and west. The country rock immediately surrounding the deposit, which is in pipe formation, is straight dolomite and chert. The deposit has been worked to a considerable depth. While the surrounding chert is practically unaltered, the dolomite in contact with the fluorspar shows decided signs of metamorphism. The deposit has produced over 30,000 tons of very high grade fluorspar in massive crystalline form, transparent with a vitreous luster. The color varies from colorless to pale green or pale blue.
>
> The Buffelshoek deposit is located several miles due north of the Malmani Oog deposit, with the country rock predominantly dolomite. This deposit has

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[11] Abbey, G. A., American vice consul, Johannesburg, South Africa, Production of Fluorspar in South Africa: MS. Rept., Oct. 30, 1930.

been worked to depth and has produced a large tonnage of high-grade fluorspar. The deposit is rectangular and the fluorspar ordinarily white, although there are occurrences of grey and green varieties. Two types of fluorspar are found in the deposit; that is, a cleavable vitreous variety and a massive noncleavable type with a splintery fracture.

There are two distinct varieties of fluorspar produced in the Marico district: The massive crystalline variety, which is cleavable and usually transparent, with a vitreous luster, and a massive variety, very compact and without any well-defined cleavage. The latter is usually dull in appearance and has a splintery fracture. Both are pure calcium fluoride with the former variety forming the bulk of production.

The colors found cover a wide range. W. Kupferburger in his survey reports the following shades:

Cleavable fluorspar

1. Colorless
2. White
3. Pale blue and bluish-green
4. Yellowish-green to sea-green
5. Pale violet to deep purple
6. Brownish claret color

Massive fluorspar

1. White
2. Grey
3. Pale mauve

All varieties found are phosphorescent, the most highly so being the brownish and dark violet from Malmani Oog and the yellowish green from Buffelshoek. All other types are only feebly phosphorescent. All deposits are of a remarkable purity.

The mineralized area in the Marico district comprises approximately 150 square miles, and practically all of the fluorspar is obtained from this district. A few thousand tons have been obtained from deposits occurring in the Bushveld granite west and southwest of Warmbaths, in the central Transvaal.

A small quantity of fluorspar of optical grade has been recovered at Malmani Oog, but ordinarily this variety contains many small white cloudy spots due to a concentration of very small liquid inclusions. Good optical grade has brought 10s. ($2.43) per ounce in London.

It has not been profitable to export anything except acid-grade spar; that is, that containing 98 per cent CaF_2, or over, with less than 1 per cent of silica.

The production of fluorspar in the Union of South Africa has been as follows:

Fluorspar produced in the Union of South Africa, 1918–1929

Year	Short tons	Value		Year	Short tons	Value	
1918	(1)	£380	$1,849	1924	11,235	£17,817	$86,706
1919	(1)	405	1,971	1925	5,383	9,016	43,876
1920	(1)	4,000	19,466	1926	9,263	17,223	83,816
1921	(1)	180	876	1927	8,358	16,536	80,472
1922	(1)	785	3,820	1928	6,153	12,086	58,816
1923	12,098	16,169	78,686	1929	2,993	6,040	29,394

[1] Data not available.

Production for 1930 has been very low due to working conditions and sales prices.

* * * Originally, when the Gubbins group was producing a large quantity for sale, the deposits were worked practically on the surface and it was possible to take out large tonnages by the most primitive methods, the native merely picking it out and loading it. While hand labor is still used, it is now necessary to work at depth and, furthermore, while there is still much massive fluorspar

present, it has now become necessary to chip it clear of galena or other substance after blasting has been done. There is only one large concern now working in the Marico district. Plans have been discussed for the installation of a power plant. This undoubtedly would permit increased production, but there is considerable doubt as to whether it would pay as the margin of profit is even now very low. Furthermore, the local mines can not compete with the European fluorspar when the silica content is over 1 per cent, and there seems to be a tendency toward increased silica content as the workings reach depth.

Under the very best working conditions it is impossible to make a large profit on fluorspar. At the present time local dealers are receiving £5 ($24.33) for the 98 per cent fluorspar containing less than 1 per cent silica in the United States. From this must be deducted the cost of production, cost of transport to the railhead (4 to 10 miles), 5s. ($1.21) per ton for loading, from 16 to 19 shillings ($3.89 to $4.62) per ton for local railway freight rates, 27s. 6d. ($6.70) per ton for ocean freight rates, plus various other charges and items. Then, if it is necessary to store materials at the coast waiting for completion of order or for steamers, or if it rains, production and transport go up, all of which add to the total charges. It can be readily seen, therefore, that the margin of profit is very small.

Local firms state that it is possible for them to increase production in the event that it can be profitably marketed in the United States or elsewhere. Practically all present production goes to the United States with the exception of small tonnages used locally.

WORLD PRODUCTION

The following table was compiled by the Bureau of Mines from official sources as far as possible.

World production of fluorspar, 1926–1930, by countries, in metric tons

[Compiled by M. T. Latus, of the Bureau of Mines]

Country	1926	1927	1928	1929	1930
Argentina [1]	---------	24	---------	---------	(2)
Australia:					
New South Wales	---------	---------	---------	96	205
Queensland	2,348	1,050	1,143	602	(2)
Canada	---------	---------	---------	16,211	73
China	(2)	3,436	(2)	(2)	(2)
Chosen	---------	---------	950	1,470	(2)
France	41,670	43,182	45,000	55,000	(2)
Germany: [3]					
Bavaria	32,475	51,001	48,552	50,797	(2)
Prussia	29,729	36,607	37,365	37,717	(2)
Saxony	17,442	22,027	16,422	18,491	(2)
Great Britain	36,459	40,362	47,614	42,432	(2)
Italy	6,320	5,577	4,520	5,740	6,560
Mexico	937	(2)	(2)	(2)	(2)
Russia [4]	3,765	840	5,551	(2)	(2)
South-West Africa	(2)	995	872	565	(2)
Spain	14,011	757	2,082	13,478	(2)
Union of South Africa	8,403	7,582	5,582	2,715	(2)
United States	116,715	102,099	127,450	132,847	86,952

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[1] Railroad shipments.

[2] Data not available.

[3] In addition to the German States listed, fluorspar is produced in Baden and Thuringia, but data of output are not available.

[4] Data for year ended Sept. 30.

CRYOLITE

Cryolite occurs in commercial quantities and is mined at only one place—Ivigtut, Greenland. The greater part of the product is shipped to Copenhagen, and the remainder is exported to the United States, from which country some is reexported to Canada. Of the cryolite shipped to the United States the greater part is used in the metallurgy of aluminum and in making opaque glass.

An article on the cryolite mine at Ivigtut was published in 1926 by Gordon.[12] He discusses the discovery, exploitation, and mining of cryolite and describes the geology and mineralogy of the deposit.

According to the Bureau of Foreign and Domestic Commerce, the United States imported 8,315 long tons of cryolite, valued at $695,794, in 1930, compared with 7,778 long tons, valued at $670,841, in 1929.

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[12] Gordon S. G., Mining Cryolite in Greenland: Eng. and Min. Jour.-Press, vol. 121, Feb. 6, 1926, pp. 236–240.

CARBON BLACK[1]

By G. R. Hopkins and H. Backus[2]

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SUMMARY

Carbon-black production reached a new high level in 1930, when the total amounted to 379,942,000 pounds, an increase over 1929 of 13,500,000 pounds, or 3.7 per cent. (See fig. 3.) Total sales of carbon black to domestic and foreign buyers in 1930 amounted to 251,539,000 pounds, a decline from 1929 of 32,267,000 pounds, or 11 per cent. Stocks, already high as the year opened, increased rapidly, and on December 31, 1930, amounted to 259,245,000 pounds, or nearly double the total on hand January 1. The increase in production and the decline in sales, with the consequent increase in stocks, resulted in a drastic reduction in prices. The average value per pound at the plants in 1930, as reported by the producers, was 3.91 cents, the lowest figure ever recorded; statistics were first compiled for 1919.

Carbon black is a jet-black, fluffy, finely divided material made by burning natural gas in a deficiency of oxygen. The outstanding physical property of carbon black is its fineness—carbon-black particles are said to average one-millionth inch in diameter, too small to be visible under the most powerful microscope and roughly one ten-thousandth of the smallest division that can be seen with the naked eye. Carbon black is not pure carbon; in fact, some of the choicest grades do not contain more than 85 per cent of that element.

In spite of the fact that practically all the large carbon-black producers have maintained research staffs for years there still remain some material gaps in the knowledge of the relationship between chemical composition and properties in actual use. This condition exists primarily because the identity of the compounds contained in carbon black is not definitely known. In the chemistry of rubber the problem is complicated further, because very little is known about the chemical composition of latex, or "milk of rubber." By trial methods, however, the rubber, ink, and other industries have established rough standards on which to base their purchases of carbon black.

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[1] Work on manuscript completed April, 1931.

[2] Figures on exports and imports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Black having some of the qualities of carbon black may be produced from oil, manufactured gas, or acetylene, or as a by-product in the re-forming of natural gas. The problem of producing carbon black from oil has long been a subject for study because of the large potential financial reward, but so far no black produced from oil has satisfied the all-important requirements as to quality. Carbon black made from manufactured gas is reported to be of superior quality, but its use under present prices is not economic. Carbon black made from acetylene is of inferior quality, and it is doubtful if this method is being used much at present.

There are two common methods of producing carbon black from natural gas—the "contact" method and the "furnace," or "retort," method. In the contact method the black is deposited when the flame impinges on a relatively cold surface. In the furnace method the black is produced by the cracking or thermal decomposition of natural gas in a retort. Furnace blacks are deficient in coloring power, but this is offset by the much higher yields, as high as 10 pounds of black per thousand cubic feet of gas being attained by the furnace method as compared with an average of less than 1.5 pounds per thousand cubic feet of gas by the contact method. The contact method may be divided further, on the basis of the character of the contact surface, into the channel, disk, and roller processes. Of these the channel process, the most recently developed, is by far the most important. As the name implies, the contact surface employed in the channel process comprises pieces of channel iron, each about 8 inches

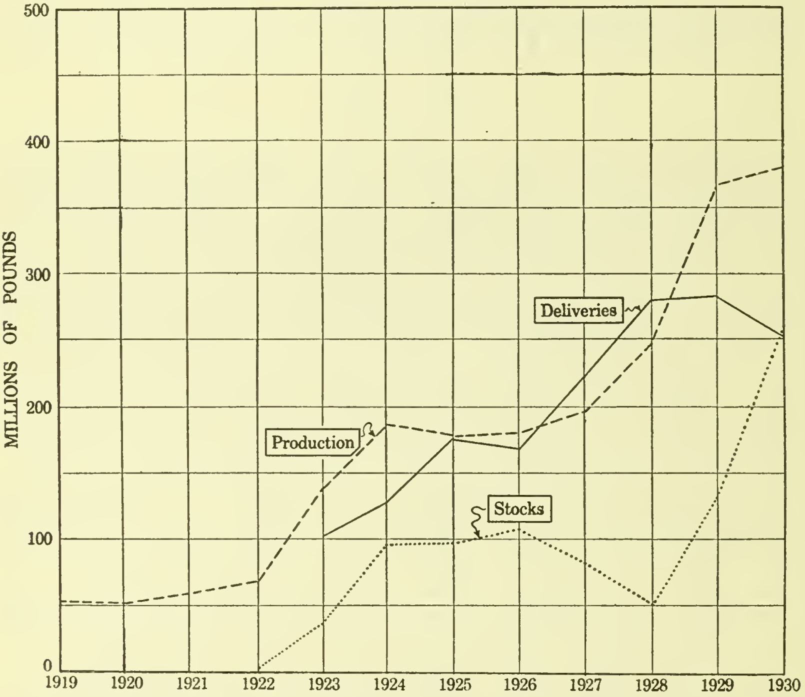

FIGURE 3.—Carbon-black production, stocks, and deliveries, 1919–1930

wide and as long as the building will permit. The channels oscillate slowly, allowing the stationary scrapers to scrape the black onto a conveyor which leads to the bolting and packing house. The roller process is used principally in the manufacture of blacks for inks; the yield by this process is low, averaging possibly 1 pound per thousand cubic feet of gas burned, but the superiority of the product in its specialized field compensates for this low yield. The production of carbon black during 1930 by the channel process amounted to 350,254,000 pounds, or 92 per cent of the total output, whereas the production by all other processes amounted to only 29,688,000 pounds, or 8 per cent of the total. These data indicate a gain in the relative importance of the channel process as compared with all other processes and consequently an increase in the relative importance of contact methods as distinguished from the retort method.

The estimated quantity of natural gas burned for the production of carbon black in 1930 amounted to 266,625,000,000 cubic feet, a slight increase over 1929. Statistics for total natural-gas consumption in 1930 indicate that the carbon-black industry utilized 14 per cent of the total quantity distributed. The average yield of carbon black per thousand cubic feet of gas burned in 1930 was 1.43 pounds, compared with 1.40 pounds in 1929. Although the 1930 figure represents the highest average recovery recorded since statistics were first compiled (1919), it is only slightly above the average of two years ago (1.42), indicating that possibly the 1930 average represents approximately the highest yield obtainable under present economic conditions. The theoretical yield of carbon from natural gas amounts to more than 30 pounds per thousand cubic feet of gas; this fact has often led to the charge that the carbon-black industry is grossly inefficient. Those making such an assertion fail to consider, however, that there is a material difference between carbon and carbon black and that the major portion of the carbon must necessarily be consumed in the flame from which the black is deposited.

As late as 1900 lampblack was the most important of the black pigments. At that time the production of carbon black was small, and its use was practically confined to ink manufacture. At present carbon black has virtually replaced lampblack for all except special uses, such as in gray paints. The rapid growth in the production of carbon black and the extremely slow growth in the output of lampblack are illustrated by the figures of production for the two commodities, which show that the output of lampblack has only increased from 7,500,000 pounds in 1900 to 10,000,000 pounds in 1930 (estimated from data supplied by J. O. Reid, of the Bureau of the Census), whereas the output of carbon black has increased sixtyfold. It should be pointed out that the increase in the use of carbon black did not result so much from the replacement of lampblack as from the discovery that carbon black is extremely beneficial to rubber, a quality lampblack does not possess.

The year witnessed a further increase in the percentage of the total gas burned for carbon black that was first treated for the recovery of natural gasoline. It is estimated that 88 per cent of the total gas consumed in the manufacture of carbon black in 1930 was so treated, compared with 87 per cent in 1929. All of the gas burned for carbon black in Texas in 1930 was first treated for natural gasoline, and the increase in the national percentage is due to the gain in production in that State. In the other carbon-black producing States the percentage of the gas treated for natural gasoline tended to decrease, possibly because of the prevailing low prices for natural gasoline or a gain in the relative importance of the companies that operate on gas too dry to treat.

Losses of carbon black at the plants in 1930 amounted to 1,361,000 pounds, or more than double the 673,000 pounds lost in 1929. It is difficult to assign a reason for the material increase in the quantity of carbon black lost; the increased output and the decline in value of the commodity may have exerted some influence. These totals do not include the material amounts of carbon black that pass off into the atmosphere as the result of drafts. Such losses have, however, been reduced consistently by improvements in the construction of buildings, and the dense black cloud of smoke which used to trail from every carbon-black plant has been reduced to a gray haze.

The economic history of the carbon-black industry, from its humble beginning in 1864 to 1930, shows that production and consumption have experienced alternating periods of ascendancy. Production has been aided by inventions, such as the Blood process of about 1885, which resulted in a rapid increase in output. On the other hand, consumption has benefited by the discovery of new uses, the most important of which was made in 1915 when it was found that carbon black could be used to toughen rubber. During the 67 years of development of carbon black, prices have fallen with the adoption of each new invention only to rise again as a new use for carbon black was discovered. Closely related to the trend in prices has been the movement of stocks which, over the entire period in general and the last two years in particular, have increased rapidly.

The present period is one in which production considerably exceeds consumption. This unsatisfactory economic condition may be alleviated by the discovery of a new use for carbon black, although probably production will be restricted voluntarily or a portion of the gas supply will be diverted for use as fuel or as a repressuring agent in oil sands. It should be pointed out, however, that the problem of restricting the production of carbon black is a difficult one, as the carbon-black producer has usually contracted to take a specified quantity of gas over a specified time from the natural-gasoline producer, who in turn has obligated himself to take a given amount of gas from the landowner.

Summary of statistics of carbon black made from natural gas in the United States, 1926–1930

	1926	1927	1928	1929	1930
Number of producers reporting	33	33	31	35	33
Number of plants	62	61	65	71	69
Quantity produced:					
By States—					
Kentucky pounds	6,309,826	5,669,000	484,000		
Louisiana do	130,376,987	124,188,000	136,320,000	127,345,000	96,729,000
Texas do	36,328,052	56,396,000	100,828,000	228,183,000	271,749,000
West Virginia do	3,804,586	2,796,000	697,000	578,000	(1)
Wyoming do	(1)	6,294,000	(1)	(1)	(1)
Other States do	3,756,725	3,086,000	10,461,000	10,336,000	11,464,000
Total do	180,576,176	198,429,000	248,790,000	366,442,000	379,942,000
By processes—					
Channel process do	152,300,410	167,357,000	220,532,000	327,552,000	350,254,000
Other processes [2] do	28,275,766	31,072,000	28,258,000	38,890,000	29,688,000
Stocks held by producers Dec. 31 do	108,378,101	82,831,000	50,240,000	132,203,000	259,245,000
Losses do	716,813	546,000	802,000	673,000	1,361,000
Quantity sold:					
Domestic—					
To rubber companies do	(3)	(3)	140,938,000	138,474,000	128,572,000
To ink companies do	(3)	(3)	27,223,000	27,350,000	19,220,000
To paint companies do	(3)	(3)	20,040,000	17,257,000	11,922,000
For miscellaneous purposes do	(3)	(3)	14,475,000	8,896,000	7,565,000
Total do	128,294,321	168,999,000	202,676,000	191,977,000	167,279,000
Export do	39,210,389	54,431,000	77,903,000	91,829,000	84,260,000
Total do	167,504,710	223,430,000	280,579,000	283,806,000	251,539,000
Value (at plants) of carbon black produced:					
Total dollars	9,939,221	10,955,000	13,782,000	18,720,000	14,852,000
Average per pound cents	5.50	5.52	5.54	5.11	3.91
Estimated quantity of natural gas used M cubic feet	130,321,000	144,087,000	175,137,000	261,107,000	266,625,000
Average yield per M cubic feet pounds	1.39	1.38	1.42	1.40	1.43

[1] Included under "Other States."

[2] Including disk, Lewis, roller, "special," and thermatomic.

[3] Figures not available.

PRODUCTION BY STATES AND DISTRICTS

The year witnessed a further gain in the standing of Texas as a carbon-black producer and a corresponding loss in the importance of Louisiana. Production in Texas in 1930 amounted to 271,749,000 pounds, or 72 per cent of the Nation's total, compared with 228,183,000 pounds, or 62 per cent of the total, in 1929. (See fig. 4.) The

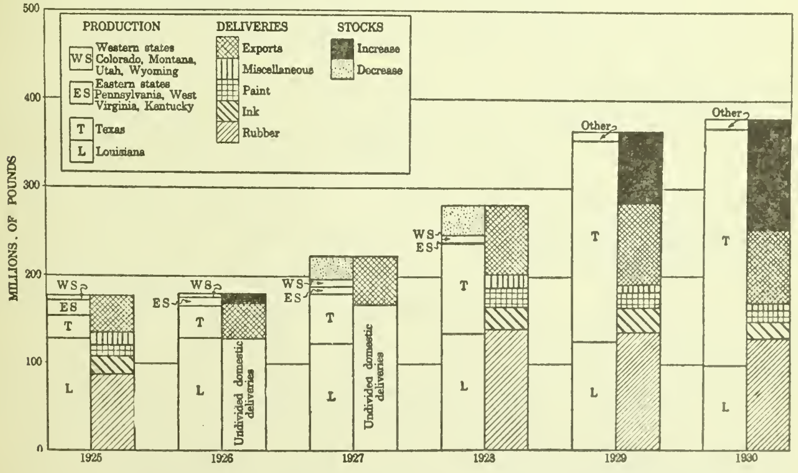

FIGURE 4.—Production and consumption of carbon black, 1925–1930

carbon-black industry in Texas is centered in the Panhandle gas field, where nearly 94 per cent of the total output of the State in 1930 was produced; the other producing district in Texas is the Breckenridge district in Eastland and Stephens Counties. Although the Breckenridge district preceded the Panhandle as a producer of carbon black in Texas it lacks both the gas reserves and the low gas price that have made the Panhandle field so attractive to carbon-black manufacturers; accordingly, production has declined steadily in recent years, so that in 1930 the output amounted to only 6 per cent of the State's total, compared with 72 per cent in 1927, the first year for which production by districts was shown. Production in Louisiana, all from the Monroe-Richland district of Morehouse, Ouachita, Richland, and Union Parishes, decreased from 127,345,000 pounds in 1929 to 96,729,000 pounds in 1930. This material decline in production resulted primarily from the competition for gas by the long natural-gas lines, such as those which run to St. Louis and Atlanta. The gas from the Monroe-Richland field is comparatively dry, and the natural gasoline extracted from it does not go as far toward defraying the initial cost of the gas as in the Panhandle. The other States producing carbon black in 1930 were Montana, Oklahoma, Utah, West Virginia, and Wyoming. Production in Montana in 1930 amounted to 842,000 pounds, about one-third of the output in 1929. The output of the four remaining producing States—Oklahoma, Utah, West Virginia, and Wyoming—amounted to 10,622,000 pounds, compared with 8,418,000 pounds in 1929.

Carbon black produced from natural gas in the United States, 1929 and 1930, by States and by major producing districts

State and district	Producers reporting	Number of plants	Production			Estimated quantity of natural gas used (M cubic feet)	Average yield per M cubic feet (pounds)
			Pounds	Value at plant			
				Total	Average (cents)		
1929							
Louisiana: Monroe-Richland district (Morehouse, Ouachita, Richland, and Union Parishes)	20	31	127,345,000	$6,731,000	5.29	103,846,000	1.23
Montana	2	2	2,496,000	134,000	5.37	2,142,000	1.17
Oklahoma	1	1	(1)	(1)	(1)	(1)	(1)
Texas:							
Breckenridge district (Eastland and Stephens Counties)	7	8	29,079,000	1,667,000	5.73	14,601,000	1.99
Panhandle district (Carson, Gray, Hutchinson, and Wheeler Counties)	13	25	199,104,000	9,692,000	4.87	136,374,000	1.46
Total Texas	[2] 15	33	228,183,000	11,359,000	4.98	150,975,000	1.51
Utah	1	1	(1)	(1)	(1)	(1)	(1)
West Virginia	2	2	578,000	35,000	6.06	342,000	1.69
Wyoming	1	1	(1)	(1)	(1)	(1)	(1)
Undistributed [3]			7,840,000	461,000	5.88	3,802,000	2.06
Total United States	[2] 35	71	366,442,000	18,720,000	5.11	261,107,000	1.40

[1] Included under "Undistributed"; Bureau of Mines not at liberty to publish figures.

[2] In counting the total number of producers, a producer operating in more than 1 State, district, or county is counted only once.

[3] Oklahoma, Utah, and Wyoming.

Carbon black produced from natural gas in the United States, 1929 and 1930, by States and by major producing districts—Continued

State and district	Producers reporting	Number of plants	Production			Estimated quantity of natural gas used (M cubic feet)	Average yield per M cubic feet (pounds)
			Pounds	Value at plant			
				Total	Average (cents)		
1930							
Louisiana: Monroe-Richland district (Morehouse, Ouachita, Richland, and Union Parishes)	19	32	96,729,000	$3,900,000	4.03	85,226,000	1.13
Montana	1	1	842,000	34,000	4.04	684,000	1.23
Oklahoma	1	1	(1)	(1)	(1)	(1)	(1)
Texas:							
Breckenridge district (Eastland and Stephens Counties)	6	7	16,905,000	689,000	4.08	8,314,000	2.03
Panhandle district (Carson, Gray, Hutchinson, and Wheeler Counties)	13	25	254,844,000	9,770,000	3.83	168,104,000	1.52
Total Texas	[2] 15	32	271,749,000	10,459,000	3.85	176,418,000	1.54
Utah	1	1	575,000	23,000	4.00	392,000	1.47
West Virginia	1	1	(1)	(1)	(1)	(1)	(1)
Wyoming	1	1	(1)	(1)	(1)	(1)	(1)
Undistributed [4]			10,047,000	436,000	4.34	3,905,000	2.57
Total United States	[2] 33	69	379,942,000	14,852,000	3.91	266,625,000	1.43

[1] Included under "Undistributed"; Bureau of Mines not at liberty to publish figures.

[2] In counting the total number of producers, a producer operating in more than 1 State, district, or county is counted only once.

[4] Oklahoma, West Virginia, and Wyoming.

CONSUMPTION

The total distribution of carbon black in 1930 amounted to 251,539,000 pounds, a decline of 11 per cent from that in 1929. Of this amount 167,279,000 pounds, or nearly two-thirds, was consigned to domestic buyers, and 84,260,000 pounds was exported. (See fig. 4.) Of the domestic deliveries 128,572,000 pounds, or 77 per cent, was sold to rubber companies; 19,220,000 pounds, or 11 per cent, to ink companies; 11,922,000 pounds, or 7 per cent, to paint companies; and 7,565,000 pounds, or 5 per cent, to companies manufacturing miscellaneous products. In comparison with 1929 these data represent an increase in the relative proportion consigned to rubber companies at the expense of consignments to ink and paint companies.

According to information compiled in 1926 and 1927, the major portion of the total carbon black distributed is handled through brokers, who at the same time are often producers. Only a small percentage of the total distribution is shipped direct to the trade by strictly producing companies.

The most important event in the history of carbon-black manufacture occurred in 1915 when it was discovered that the addition of a relatively small amount of carbon black to a rubber mixture greatly increased its tensile strength, resiliency, and resistance to abrasion. Before that time carbon black had been used as a coloring agent in rubber but only in a small way. After 1915 the production of carbon black increased rapidly, but it did not catch up with the demand until about 1924. The output of carbon black received its greatest impetus in 1923, when rubber manufacturers practically insisted that a greater supply be made available to them. According to trade-journal estimates the consumption of carbon black by the rubber industry in 1920 amounted to 20,000,000 pounds. By 1925 such consumption had increased to 86,329,000 pounds and by 1928 to 140,938,000 pounds. In view of this rapid growth it is not surprising that carbon-black manufacturers devote the largest part of their sales effort toward increasing their sales to rubber companies. On the other hand, although carbon black is indispensable in inks and is almost a necessity to manufacturers of black paints, such consumers are practically neglected during sales campaigns.

Because of the close relationship between the carbon black and rubber industries it may be helpful to cite the following data relative to rubber consumption, supplied by E. G. Holt, chief, rubber division, Bureau of Foreign and Domestic Commerce.

According to Holt, the total consumption of crude rubber in 1930 amounted to 376,000 long tons, a decline of 91,400 tons, or 20 per cent, from the previous year. Approximately two-thirds of the total consumption of rubber in the United States in 1930 was used in producing approximately 53,000,000 casings, the remaining one-third being used in the manufacture of thousands of miscellaneous articles.

As the percentage decline in consumption of rubber exceeded the decline in quantity of carbon black used by the rubber industry, the average consumption of carbon black per article must have increased.

Carbon black is not the only material that can be used advantageously in rubber as a filler or strengthening agent. The white pigment zinc oxide is its keenest competitor and, until the last few years, was widely used as a filler in rubber; however, the severe decline in carbon-black prices has made it almost impossible for zinc oxide to compete, except where bright-colored rubber articles are desired or where a rubber with special properties is needed.

The second most important use of carbon black is in inks, of which newsprint ink is by far the most important. Carbon black mixed with oil has great "covering" power and is considered indispensable by the operators of modern high-speed presses. The increase in the use of carbon black in inks is limited by the increase or decrease in the output of newsprint. The consumption of carbon black in inks declined from 27,350,000 pounds in 1929 to 19,220,000 pounds in 1930, or 30 per cent. According to N. S. Meese, assistant chief, paper division, Bureau of Foreign and Domestic Commerce, this material decrease resulted from the fact that "the actual consumption of newsprint paper in the United States was appreciably less, owing to the marked fall in advertising, the reduction in size of Sunday and some daily papers, and the passing out of existence of several publications in various parts of the country, all of which has tended to an actual reduction in the use of newsprint ink." As a further reason for the decline in the figures for consumption of carbon black in inks in 1930, it has been suggested that a portion of the total reported sold to ink companies in previous years may have been resold for other purposes. It has been estimated that the carbon black used by ink manufacturers in 1930 did not cost much more than $1,000,000, an inconsequential item when compared with the value of the printed matter turned out.

The third most important use of carbon black is in the paint industry in mixed paints, japans, varnishes, and enamels. Carbon black has practically supplanted lampblack and other blacks in paints, although for certain uses, such as in gray paints, lampblack is unquestionably superior. Lampblack is easier to mix than carbon black and is therefore used in some of the cheaper paints. The consumption of carbon black by the paint industry in 1930 amounted to 11,922,000 pounds, compared with 17,257,000 pounds in 1929. This material decline resulted primarily from the reduction in output of paints, but undoubtedly part of it was due to the tendency to replace black by colored finishes in the automobile industry.

Carbon black is used as a coloring agent or as a filler in a number of articles, such as typewriter ribbons, carbon paper, shoe and stove polishes, phonograph records, crayons, artificial stone, and paper. The consumption of carbon black in these and other miscellaneous articles in 1930 amounted to 7,565,000 pounds, compared with 8,896,000 pounds in 1929.

NUMBER AND CAPACITY OF PLANTS

After increasing steadily since 1927 the number of carbon-black plants in actual operation declined in 1930 to 69, compared with 71 active plants in 1929 and 36 in 1919. The net loss of two active plants in 1930 resulted from the closing down of two plants in Ouachita Parish, La., and one plant each in Fallon County, Mont., and Ritchie County, W. Va., and the construction of one plant each in Ouachita and Richland Parishes, La. The loss of the plant in West Virginia leaves only one plant in that State as the sole survivor east of the Mississippi.

The total daily capacity of the plants operated during 1930 amounted to 1,481,175 pounds, compared with a total capacity of 1,442,425 pounds for those operated during 1929. These data indicate an increase in producing facilities of only 3 per cent in 1930, compared with 15 per cent in 1929.

At present (April, 1931) the carbon-black industry of the United States is supplying approximately 700,000 pounds daily to the trade; this supply, in comparison with an estimate of the total daily capacity, indicates a surplus capacity of at least 100 per cent. This economic change is drastic for an industry that less than 10 years ago was unable to satisfy the demand.

Of primary importance to the industry was the construction of a plant in west Texas in 1930. This plant, in the Big Lake field of Reagan County, was placed in operation early in 1931; it uses residue gas obtained from a natural-gasoline plant in the field. The construction of the plant is of particular interest not only because it marks the beginning of carbon-black manufacture in west Texas but because it represents another distinct step in the westward migration of the industry.

Number and daily capacity of carbon-black plants in the United States, 1929 and 1930, by counties or parishes

State	County or parish	Number of plants		Total daily capacity (pounds)	
		1929	1930	1929	1930
Louisiana	Morehouse	8	8	97,400	103,900
	Ouachita	21	21	333,675	331,925
	Richland	1	2	15,000	26,000
	Union	1	1	19,500	19,500
		31	32	465,575	481,325
Montana	Fallon	1	(1)	4,000	(1)
	Stillwater	1	1	5,000	5,000
		2	1	9,000	5,000
Oklahoma	Seminole	1	1	(2)	(2)
Texas	Carson	2	2	86,800	86,800
	Eastland	2	2	12,250	12,250
	Gray	8	8	276,400	301,400
	Hutchinson	12	12	437,000	450,500
	Stephens	6	5	92,400	67,400
	Wheeler	3	3	24,000	24,000
		33	32	928,850	942,350
Utah	Grand	1	1	(2)	5,500
West Virginia	Logan	1	1	2,000	(2)
	Ritchie	1	(1)	1,500	(1)
		2	1	3,500	(2)
Wyoming	Niobrara	1	1	(2)	(2)
Undistributed [3]				35,500	47,000
United States		71	69	1,442,425	1,481,175

[1] Closed down before Jan. 1, 1930.
[2] Included under "Undistributed"; Bureau of Mines not at liberty to publish figures.
[3] 1929: Oklahoma, Utah, and Wyoming; 1930: Oklahoma, West Virginia, and Wyoming.

PRODUCERS

Carbon-black producers of the United States, as of January 1, 1931

State and company	County	Nearest town	Process
Louisiana:			
Carson Carbon Co., P. O. Box 880, Cincinnati, Ohio.	Morehouse	Collinston	Channel.
Century Carbon Co., Monroe, La	Ouachita	Swartz	Do.
	Richland	Archibald	Do.
Coltexo Corporation, 45 East 42d St., New York, N. Y.	Ouachita	Hammock	Do.
J. Smylie Herkness, Route No. 3, Bastrop, La	Morehouse	Bastrop	Do.
J. M. Huber Co. of Louisiana (Inc.), 460 West 34th St., New York, N. Y.	Ouachita	Swartz	Do.
Imperial Oil & Gas Products Co., 1104 Union Bank Bldg., Pittsburgh, Pa.	do	Sterlington	Do.
International Gas Products (Inc.), 411 Bernhardt Bldg., Monroe, La.	Richland	Archibald	Do.
Interstate Natural Gas Co. (operated by Columbian Carbon Co., trustee), 45 East 42d St., New York, N. Y.	Union	Spencer	Do.
Keystone Carbon Co., Monroe, La	Ouachita	Monroe	Do.
Monroe-Louisiana Carbon Co., 45 East 42d St., New York, N. Y.	do	Hancock	Lewis.
North America Carbon Corporation (Inc.), 1611 Slattery Bldg., Shreveport, La.	do	Swartz	Channel.
Peerless Carbon Black Co., 3003 Grant Bldg., Pittsburgh, Pa.	do	Bourland	"Special."
	do	Guthrie	Do.
Southern Carbon Co., 45 East 42d St., New York, N. Y.	Morehouse	Perryville	Channel.
	do	Spyker	Do.
	Ouachita	Fairbanks	Do.
	do	Fowler	Do.
	do	Swartz	Do.
Texas-Louisiana Producing & Carbon Co., P. O. Box 181, Monroe, La.	do	Not reported (2 plants).	Do.

Carbon-black producers of the United States, as of January 1, 1931—Continued

State and company	County	Nearest town	Process
Louisiana—Continued.			
Thermatomic Carbon Co., 108 Ferry St., Pittsburgh, Pa.	Ouachita	Sterlington	Thermatomic.
Tire Carbon Co., P. O. Box 11, Shreveport, La.	do	Swartz	Channel.
Union Gas Products (Inc.), 714 Ouachita Bank Bldg., Monroe, La.	do	do	Light channel.
United Carbon Co., P. O. Box 1475, Charleston, W. Va.	Morehouse	Bastrop	Channel.
	do	Dewdrop	Do.
	do	Humphreys	Do.
	Ouachita	Cargas	Do.
	do	Phillips	Do.
	do	Swartz	Do.
United Gas Public Service Co., Monroe, La.	Morehouse	Bastrop	Do.
Montana: Crystal Carbon Co. (United Carbon Co., owner), P. O. Box 1475, Charleston, W. Va.	Stillwater	Molt	Do.
Oklahoma: Cabot Carbon Co., 940 Old South Bldg., Boston, Mass.	Seminole	Not reported	Do.
Texas:			
Cabot Carbon Co., 940 Old South Bldg., Boston, Mass.	Gray	Pampa	Do.
	Hutchinson	Wewauka	Do.
Cabot Co., 940 Old South Bldg., Boston, Mass.	Carson	Skellytown	Channel and roller.
Coltexo Corporation, 45 East 42d St., New York, N. Y.	Gray	Lefors	Channel.
	Stephens	Parks	Do.
Crescent Carbon Co., Point Pleasant, W. Va.	Hutchinson	Borger	Do.
Eastern Carbon Black Co. (United Carbon Co., owner), P. O. Box 1475, Charleston, W. Va.	do	Borger (3 plants)	Do.
	do	Borger	Channel and disk.
General Atlas Chemical Co., 60 Wall St., New York. N. Y.	Gray	Pampa	"Special."
J. M. Huber Co. of Louisiana (Inc.), 460 West 34th St., New York, N. Y.	Hutchinson	Borger	Channel.
Kosmos Carbon Co. (United Carbon Co., owner), P. O. Box 1475, Charleston, W. Va.	do	Borger (2 plants)	Do.
Magnolia Petroleum Co., Dallas, Tex.	Carson	Skellytown	Do.
	Gray	Pampa	Do.
	Stephens	Breckenridge	Do.
	Wheeler	Lela	Do.
Palmer Carbon Co., P. O. Box 11, Shreveport, La.	Hutchinson	Borger	Do.
Panhandle Carbon Co., P. O. Box 11, Shreveport, La.	do	do	Do.
Peerless Carbon Black Co., 3003 Grant Bldg., Pittsburgh, Pa.	Eastland	Pioneer	"Special."
Texas Carbon Industries (Inc.), P. O. Box 55, Breckenridge, Tex.	Stephens	Breckenridge (2 plants).	Channel.
Texas Elf Carbon Co., 940 Old South Bldg., Boston, Mass.	Gray	Pampa	Do.
	Stephens	Eliasville	Do.
Western Carbon Co., 45 East 42d St., New York, N. Y.	Eastland	Pioneer	Do.
	Gray	Kings Mill	Do.
	do	Lefors	Do.
	do	Pampa	Do.
	Hutchinson	Borger	Do.
	Wheeler	Lela	Do.
	do	Magic City	Do.
Utah: Crystal Carbon Co. (United Carbon Co., owner), P. O. Box 1475, Charleston, W. Va.	Grand	Cisco	Do.
West Virginia: Columbian Carbon Co., 45 East 42d St., New York, N. Y.	Logan	Chapmanville	Do.
Wyoming: J. M. Huber Co. of Louisiana (Inc.), 460 West 34th St., New York, N. Y.	Niobrara	Manville	Do.

PRICES AND VALUES

The average value of carbon black at the plants in 1930 was 3.91 cents per pound, the lowest figure ever recorded. From 1925 to 1928 the annual average value at the plants remained virtually unchanged, ranging from 5.43 to 5.54 cents per pound. Late in 1929 prices weakened somewhat, and the annual average fell to 5.11 cents, but the real collapse of the price structure took place in 1930. At the close of the year some black was reported to have moved for as low as 3 cents per pound, a price below the cost of production. According to the spot prices compiled by one of the chemical trade papers the price of the carbon black used in lithographer's inks remained at 22 cents per pound during 1929 and 1930; this price may appear high, but the product is quite different from ordinary channel black, and its production requires the most careful treatment. Contract prices for channel black in Louisiana fell from 6.1 cents per pound on January 1, 1930, to 4.1 cents as the year closed; contract prices in Texas fell from 6 to 4 cents during the same period. The chief reason for the drastic decline in prices in 1930 was the material overproduction and the consequent increase in stocks.

As is usually the case during periods of falling prices, marketing methods were changed radically during 1930. Consumers were reluctant to make long-term contracts, preferring to purchase their requirements in the spot market. This change of policy resulted from the large quantities of "distress" product thrown on the market by the weaker producing interests.

The total value at the plants of the carbon black produced in 1930 amounted to $14,852,000, compared with $18,720,000 in 1929. These totals represent wholesale values with brokerage and freight not included, so that the total eventual cost to consumers was considerably higher. Whatever the cost, however, it was but a small fraction of the saving to the public through use of the carbon black in tires and other articles.

Quoted prices of various grades of carbon black, 1929 and 1930, in cents per pound

[Oil, Paint and Drug Reporter]

Date	Lithoink qualities (bags)	Standard rubber, ink, and paint qualities (bags, cases)	Works, Louisiana (bags)	Works, Texas (bags)
1929				
Jan. 7	22.0	13.0	7.5	8.0
Apr. 29		12.0		
Nov. 18		10.5		6.4
Dec. 9				6.0
1930				
Jan. 6			6.1	
Jan. 13			5.85	5.75
Jan. 20			5.6	5.5
Feb. 24		9.5	5.1	5.0
June 30		8.0	4.6	4.5
Oct. 6		7.5	4.1	4.0

FOREIGN TRADE

Exports of carbon black constitute an important factor in the industry and for the past three years have averaged 31 per cent of total deliveries. The chief reason for the high percentage exported is the lack of production outside the United States. Only a few foreign countries have surplus natural gas; and, so far as is known to the writer, none of them utilize it in the production of carbon black. Total exports of carbon black from the United States in 1930 amounted to 84,260,447 pounds, a decline from 1929 of 7,568,768 pounds, or 8 per cent. The 1930 exports were valued at $5,789,458, an average of 6.87 cents per pound. This average represents a material decline from the average of 9.01 cents reported for 1929, but is considerably above the domestic price level. The United Kingdom continued to be the leading carbon-black customer and was again followed in order by France, Germany, and Canada. Exports of carbon black to the United Kingdom in 1930 amounted to 24,017,974 pounds, compared with 23,273,769 pounds in 1929; this increase was probably the brightest feature of 1930 to carbon-black producers, as the year marked the first serious decline in the export trade.

Imports of carbon black were recorded by the Bureau of Foreign and Domestic Commerce in 1930 for the first time; the total is given as 61,750 pounds, valued at $6,175. These imports were reported as received from Canada, but as that country has no carbon-black plants it is believed that they consisted of some other type of black, such as acetylene black.

Carbon black exported from the United States, 1928–1930, by countries

Country	1928		1929		1930	
	Pounds	Value	Pounds	Value	Pounds	Value
Australia	3, 384, 455	$299, 112	5, 705, 833	$510, 526	2, 630, 771	$184, 283
Belgium	1, 212, 626	106, 742	2, 260, 152	196, 946	2, 644, 502	174, 676
Canada	11, 636, 500	794, 925	13, 890, 749	975, 002	11, 757, 174	601, 134
China	1, 153, 575	96, 153	1, 049, 680	97, 417	995, 423	70, 614
France	14, 595, 631	1, 378, 392	16, 698, 430	1, 708, 131	16, 438, 685	1, 179, 074
Germany	13, 432, 720	1, 176, 069	14, 049, 753	1, 363, 124	12, 369, 542	902, 712
Italy	3, 439, 691	312, 150	2, 544, 267	239, 907	2, 485, 113	210, 034
Japan	5, 549, 962	483, 450	5, 113, 956	469, 511	4, 402, 010	299, 254
Netherlands	1, 947, 333	175, 707	2, 006, 238	188, 991	1, 896, 430	138, 249
United Kingdom	18, 887, 337	1, 721, 199	23, 273, 769	2, 068, 911	24, 017, 974	1, 695, 203
Other	2, 663, 323	250, 325	5, 236, 388	452, 371	4, 622, 823	334, 225
	77, 903, 153	6, 794, 224	91, 829, 215	8, 270, 837	84, 260, 447	5, 789, 458

CARBON-BLACK ASSOCIATION

The carbon-black industry, like most important industries, maintains a trade association to promote the welfare of its members and to collect and distribute statistics. This association, known as the National Gas Products Association, maintains an office at 90 Wall Street, New York City. The present officers are Godfrey L. Cabot, president; Oscar Nelson, vice president; H. W. Huber, vice president; G. A. Williams, treasurer; Reid L. Carr, secretary; A. F. Kitchel, assistant secretary; and C. H. Rohrbach, statistical secretary.

POTASH[1]

By A. T. Coons

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PRODUCTION AND SALES

Potassium salts produced in the United States in 1930 contained the equivalent of 61,270 short tons of potash (K_2O), less than 1 per cent below the record production of 1929. The average content calculated as potash (K_2O) in the salts produced was 57.9 per cent in 1930, compared with 57.1 per cent in 1929.

The total production of potassium salts in 1930 was 105,810 short tons—2 per cent less than in 1929. Sales of potassium salts (98,280 tons) were 3 per cent less and the potash (K_2O) equivalent (56,610 tons) of the material sold was 1.6 per cent less than in 1929. The total value ($2,986,157) of the potassium salts sold was slightly less than in 1929; the value per unit (20 pounds of K_2O) was 52.7 cents in 1930, compared with 51.9 cents in 1929. In 1930, as in 1929, the total sales were less than the production.

The stocks of salts and their equivalent as potash (K_2O) remaining in producers' hands at the end of 1930 were more than one and one-half times those at the end of 1929. The same number of plants reported production, sales, and stocks on hand in 1930 as in 1929.

Tables of sales by States and by sources are omitted to avoid disclosing individual production. A summary of production, sales, and producers' stocks of potassium salts in the United States for the past 10 years is given in the following table:

Potassium salts produced, sold, and in stock in the United States, 1921–1930

Year	Production			Sales				Stocks		
	Number of plants	Potassium salts (short tons)	Equivalent as potash (K_2O) (short tons)	Number of plants	Potassium salts (short tons)	Equivalent as potash (K_2O) (short tons	Value f. o. b. plant	Number of plants	Potassium salts (short tons)	Equivalent as potash (K_2O) (short tons)
1921	20	25,485	10,171	23	10,337	4,408	$447,859	30	32,925	12.625
1922	12	25,176	11,714	16	22,028	11,313	463,512	16	30,100	11,653
1923	12	39,029	20,215	11	35,164	19,281	784,671	14	34,794	12,363
1924	12	43,734	22,903	9	37,492	21,880	842,618	11	32,389	10,770
1925	9	51,565	25,448	7	52,823	25,802	1,204,024	7	[a] 30,919	10,276
1926	7	46,324	23,366	6	51,369	25,060	1,083,064	4	[b] 26,000	[b] 9,000
1927	9	76,819	43,510	5	94,722	49,500	2,448,146	8	7,250	2,500
1928	9	104,129	59,910	5	105,208	60,370	3,029,422	7	6,260	2,100
1929	5	107,820	61,590	4	101,370	57,540	2,988,448	5	12,650	6,200
1930	5	105,810	61,270	4	98,280	56,610	2,986,157	5	20,550	11,000

[a] Of this quantity 212 tons was lost by leaching, etc.

[b] Estimate.

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[1] Work on manuscript completed May, 1931.

PRODUCING LOCALITIES

In 1930 the potassium salts produced were from natural brines, from the waste from molasses distillation, from alunite, and from incinerated cotton bolls. The American Potash & Chemical Corporation (233 Broadway, New York, N. Y., and Trona, Calif.), the chief American producer of potassium salts, also recovered borax and other natural sodium salts as coproducts at its plant at Trona (Searles Lake), San Bernardino County, Calif. Its output of potassium salts was slightly less in 1930 than in 1929, and somewhat less was marketed than was produced. The product sold by this company has a higher equivalent of potash (K_2O) than that of any other company, and the per cent in 1930 (61.54) was higher than in 1929 (61.29). The plant of the United States Industrial Chemical Co. (110 East Forty-second Street, New York, N. Y.) at Baltimore, Md., was the second largest producer of potassium salts in 1930. Two grades of salts were made by this company in 1930. One grade, known as "vegetable ash," was the ash obtained by incineration of the waste from molasses distillation and averaged 33.4 per cent of potash (K_2O); the other potash material, known as "sulphate-muriate," was the dust collected from the fumes of combustion during the incineration and averaged 54.475 per cent of potash (K_2O). The company's total sales were slightly less than its production. Alunite was mined at Sulphur, Humboldt County, Nev., by the American Alunite Corporation, of Los Angeles, Calif., and shipped to California, where it was crushed and marketed as fertilizer material by the Alunite Fertilizer Sales Co., of Beverly Hills, Calif. A small quantity of alunite was also mined at Marysvale, Piute County, Utah, by the Marysvale Cash Store and distributed for experimental work on fertilizers. Cotton boll or cottonseed hull ashes containing about 25 per cent water-soluble potash (K_2O) were sold in 1930, chiefly as fertilizer for tobacco, by the F. W. Brodé Corporation (119 Madison Avenue, Memphis, Tenn.). These ashes have been sold at irregular intervals for several years. They have not, however, been included in the potash production figures since 1917. They are produced in the Cotton Belt States and come into the distributors' hands in small lots from various localities. As there is no means for allocating this material according to producing plants, the distributor is given credit for the entire production and sales.

A shaft was sunk and considerable work was done in 1930 on deposits of potash-bearing minerals near Carlsbad, N. Mex., and potassium salts will doubtless be shipped from this area in 1931 by the United States Potash Co., of Carlsbad, N. Mex.

Experimental work was also done by the Bureau of Mines and the Department of Agriculture on the recovery of potassium salts suitable for fertilizer from polyhalite found in Texas and New Mexico; from leucite found in Wyoming; and from greensand marl found in New Jersey. The results of the foregoing investigations and of others carried on by the United States Bureau of Mines, the United States Geological Survey, and other Government bureaus in Texas, New Mexico, and other potash-bearing localities are issued in separate publications and are not reviewed in this report.

IMPORTS AND EXPORTS [2]

Imports of potash materials are shown in the following tables. The materials are classified as salts used chiefly in the fertilizer industry and as those used chiefly in the chemical industries. The former class, which includes kainite, manure salts, muriate, and sulphate, accounted for more than 94 per cent of the total potash (K_2O) imports in 1930.

The potash (K_2O) equivalents of the different salts in 1930 are calculated on the same estimated percentages as were used for 1929 and 1928.

Potash materials imported for consumption in the United States, 1929 and 1930

Material	Approximate equivalent as potash (K_2O) (per cent)	1929				1930			
		Short tons	Approximate equivalent as potash (K_2O)		Value	Short tons	Approximate equivalent as potash (K_2O)		Value
			Short tons	Per cent of total			Short tons	Per cent of total	
Used chiefly in fertilizers:									
Kainite	14.0	85,042	12,000	3.7	$643,950	125,454	18,000	5.3	$979,487
Manure salts	24.0	437,727	105,000	32.3	5,113,085	405,215	97,000	28.3	5,048,302
Muriate (chloride)	52.0	258,682	135,000	41.6	8,224,661	306,047	159,000	46.5	9,929,801
Sulphate	50.0	89,051	45,000	13.9	3,647,839	96,608	48,000	14.0	3,947,479
		870,502	297,000	91.5	17,629,535	933,324	322,000	94.1	19,905,069
Used chiefly in chemical industries:									
Bicarbonate	46.0	340	156	8.5	36,987	87	40	5.9	9,876
Bitartrate (argols)	20.0	8,843	1,769		2,077,763	9,109	1,822		1,862,220
Bitartrate (cream of tartar)	25.0	83	21		26,435	22	6		8,051
Bromide	39.6	14	6		9,834	32	13		16,439
Carbonate, crude	61.0	11,322	6,906		1,024,106	9,121	5,564		848,214
Carbonate, crude or black salts	50.0								
Carbonate, refined	67.0								
Caustic	80.0	7,821	6,257		1,000,249	4,661	3,729		492,981
Chlorate and perchlorate	36.0	6,808	2,451		484,576	6,454	2,323		470,745
Chromate and bichromate	40.0	4	2		1,537	([a])	([a])		347
Cyanide	70.0	68	48		54,204	45	32		31,908
Ferricyanide (red prussiate)	42.0	78	33		40,992	85	36		45,302
Ferrocyanide (yellow prussiate)	44.0	57	25		14,389	10	4		2,667
Iodide	28.0	[b] 1	([b])		5,181	([b])	([b])		85
Nitrate (saltpeter), crude	40.0	14,336	5,734		545,576	14,335	5,734		620,146
Nitrate (saltpeter), refined)	46.0	9,036	4,157		687,130	1,465	674		113,813
Permanganate	29.0	17	5		3,162	91	26		16,284
Rochelle salt	22.0	6	1		2,072	5	1		1,709
All other	50.0	134	67		28,913	160	80		48,670
		58,968	27,638	8.5	6,043,106	45,682	20,084	5.9	4,589,457
Grand total	--------	929,470	324,638	100.0	23,672,641	979,006	342,084	100.0	24,494,526

[a] Quantity of bichromate imported was 1,043 pounds; approximate equivalent as K_2O is 417 pounds.

[b] In 1929 quantity of iodide imported was 1,262 pounds; approximate equivalent as K_2O is 353 pounds. In 1930 quantity of iodide imported was 16 pounds; approximate equivalent as K_2O is 4.5 pounds.

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[2] Figures on quantity and value of imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

In 1913, when the entire supply was imported, the United States imported the equivalent of 272,457 short tons of potash (K_2O); in 1930 the imports were 342,084 tons of potash (K_2O), or 25.6 per cent more than in 1913 and 5.4 per cent more than in 1929. However, 1928, 1929, and 1930 are the only years, beginning with 1914, in which the imports of 1913 have been exceeded. The imports in 1930 were more than five and one-half times the production of potash (K_2O) in the United States in that year. The combined imports and domestic production in 1930 were one and one-half times the imports in 1913. The potash (K_2O) imported chiefly for fertilizer in 1930 showed an increase over 1929 of 8 per cent; that for use chiefly by chemical industries decreased 27 per cent.

Approximate equivalent as potash (K_2O) of potash-bearing materials imported for consumption in the United States, 1921–1930, in short tons

1921	78, 698	1926	266, 280
1922	201, 415	1927	244, 155
1923	209, 950	1928	330, 493
1924	200, 365	1929	324, 638
1925	258, 217	1930	342, 084

The following table indicates the amount of potash-bearing materials imported in 1930 and the countries from which last shipment was made. Virtually all of the crude salts and much the larger part of the refined salts imported originated in Germany and France.

Potash materials imported into the United States in 1930, in short tons

[General imports. The figures in parentheses in the column headings indicate in per cent the approximate equivalent as potash (K_2O)]

Country	Muriate (chloride) (52)	Sulphate (50)	Manure salts (24)	Kainite (14)	Bitartrate		Caustic (80)	Carbonate (61)	Cyanide (70)	Nitrate (saltpeter) crude (40)	Chlorate and perchlorate (36)	All other (50)	Total	
					Argols or wine lees (20)	Cream of tartar (25)							Short tons	Value
Africa: Algeria and Tunisia					1, 121								1, 121	$243, 619
Argentina		417			1, 115					263			1, 795	204, 076
Austria												22	22	11. 335
Belgium	107, 278	6, 813	152, 697	42, 629									309, 417	5, 931, 983
Canada	648	17	2		3	(1)				99	2		771	30, 585
Chile					105					10, 496			10, 601	415, 835
Czechoslovakia								352				35	387	35, 827
France					3, 698				1	278	76	19	4. 072	864, 449
Germany	156, 353	87, 351	243, 583	80, 695			4, 493	6, 646	39	3. 198	7, 322	1, 840	590, 920	14, 321. 061
Greece					117								117	20, 246
Italy					1, 632	30							1, 662	341, 432
Mexico								31					31	3, 876
Netherlands	15, 957	2, 010	8, 933	2, 520			29	823				24	30, 296	828, 040
Portugal					784								784	144, 124
Soviet Russia in Europe								1, 257					1, 257	118. 866
Spain	25, 811				466								26, 277	941, 794
Sweden							116				81		197	46, 328
Switzerland									6		72	3	81	14, 254
United Kingdom				211			23	12		1		29	276	19, 947
	396, 047	96, 608	405, 215	125, 455	9, 041	30	4, 661	9, 121	46	14, 335	7, 553	1, 972	980, 084	24, 537, 677
Approximate equivalent as potash (K_2O)	159, 000	48. 000	97, 000	18, 000	1, 808	8	3. 729	5, 564	32	5, 734	2, 719	986	342, 580	

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[1] Less than 1 ton.

Potassium salts exported from the United States, 1922–1930

Year	Short tons	Value	Year	Short tons	Value
1922	6, 238	$780, 996	1927	1, 965	$487, 726
1923	3, 997	505, 837	1928	2, 619	609, 018
1924	1, 923	301, 036	1929	1, 523	583, 668
1925	2, 155	398, 740	1930	1, 256	498, 774
1926	1, 679	319, 201			

In 1929, for the first time, exports of potash fertilizer material were published by the Bureau of Foreign and Domestic Commerce separately from those of other fertilizer materials. The total exports in 1929 and 1930 and the receiving countries are shown in the following table:

Potash fertilizer material exported from the United States, 1929 and 1930, by countries

Country	1929		1930	
	Short tons	Value	Short tons	Value
Barbados			1	$38
Canada	426	$17, 620	3, 478	121, 357
Colombia	2	240	2	279
Cuba	296	11, 092		
Dominican Republic	10	532	1	70
Greece	366	24, 443		
Honduras			11	564
Hong Kong	1, 312	46, 000		
Japan	11, 243	383, 290	12, 858	483, 818
Mexico			12	923
Newfoundland and Labrador	2	99	672	36, 000
Nicaragua			7	318
Panama	1	32		
Philippine Islands	1, 874	99, 342		
	15, 532	582, 690	17, 042	643, 367

The potash (K_2O) content of these salts is not known, but it is estimated that it will average 45 to 60 per cent. More than 80 per cent of the shipments are made from Pacific coast customs ports.

TARIFF

Potassium salts for fertilizer, which were on the free list, were not changed by the tariff act of June, 1930. There were some changes in other potassium salts, as shown in the following table:

Tariff on potassium salts prior to and since June, 1930[1]

Commodity		Prior to June, 1930	Act of June, 1930
Bicarbonate	per pound	1½¢	1½¢
Bitartrate:			
Argols (less than 90 per cent bitartrate)	ad valorem	5%	Free.
Argols (90 per cent or more bitartrate)	per pound	5¢	5¢
Cream of tartar	do	5¢	5¢
Bromide	do	10¢	10¢
Carbonate, crude	do	¾¢	¾¢
Caustic hydroxide	do	1¢	1¢
Chlorate	do	2¼¢	1½¢
Chromate and dichromate	do	2¼¢	2¼¢
Cyanide		Free.	Free.
Ferricyanide, red	per pound	7¢	7¢
Ferrocyanide, yellow	do	4¢	4¢
Iodide	do	25¢	25¢
Nitrate (saltpeter), crude		Free.	Free.
Nitrate (saltpeter), refined	per pound	½¢	1¢
Perchlorate	do	1½¢	1½¢
Permanganate	do	6¢	6¢
Rochelle salt	do	5¢	5¢
All other	ad valorem	25%	25%

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[1] Tariff act, June, 1930, pars. 5, 9, 78, 1611, 1667, and 1746.

CONSUMPTION

The calculated consumption of potash (K_2O) in the United States in 1930, as indicated by imports plus sales of domestic products minus exports of potash fertilizer material (exports for other purposes being negligible), was 1,060,244 short tons of material equivalent to approximately 390,000 tons of K_2O, an increase of 4 per cent over the 374,000 tons of K_2O consumed in 1929. It will be noted that in this report the exports of potash fertilizer material (for which figures were first available in 1929) are taken into account in compiling the calculated consumption for the years 1929 and 1930. Thus, although the calculated consumption for 1929 and 1930 is not computed by exactly the same method as that used for other recent years, the data can be compared with figures for the preceding decade, as the volume of exports is still relatively small. About 95 per cent of the total supply of potash (K_2O) in 1930 was used in the manufacture of fertilizers.

MARKET CONDITIONS

Market conditions showed little change from those of the preceding year. As cotton, tobacco, and "truck" are the chief potash-consuming crops the States east of the Mississippi River and south of the Ohio River and the Mason and Dixon line are the chief users of potash, although in the Northeastern States potash is used for growing potatoes and other vegetables. The prices at which foreign potash has been available have continued to curb American production and particularly to discourage the launching of new enterprises.

PRICES

The prices of foreign potassium salts, which were increased May 1, 1929, after having remained unchanged since December 1, 1926, were again increased February 25, 1930, in accordance with an announcement by the N. V. Potash Export My. (Inc.), American sales agents for the French and German potash syndicates. It was also announced that for economic reasons the grade kainite 12.4 per cent K_2O had been eliminated from the price list in favor of kainite 14 per cent K_2O.

Advances in prices for comparable grades of salts were made in amounts ranging from 10 to 50 cents a short ton and were guaranteed against reduction in continental United States until April 30, 1931. The prices prevailing from 1925 to 1930, as reported by the N. V. Potash Export My. (Inc.), are given in the following table:

Quoted prices of different grades of potassium salts, 1925–1930

[Per ton of 2,000 pounds, c. i. f. Atlantic and Gulf ports]

		Oct. 1, 1925, to Nov. 30, 1926	Dec. 1, 1926, to Apr. 30, 1929	May 1, 1929, to Feb. 24, 1930	Feb. 25, 1930, to Dec. 31, 1930
Sulphate, 90 to 95 per cent K_2SO_4	in bags	$45.85	$47.30	$47.75	$48.25
	in bulk	44.60	45.70	46.15	46.65
Muriate, 80 to 85 per cent KCl	in bags	34.90	36.40	36.75	37.15
	in bulk	33.65	34.80	35.15	35.55
Potash-magnesia sulphate (double manure salts), 48 to 53 per cent K_2SO_4	in bags	26.35	27.25	27.50	27.80
	in bulk	25.10	25.65	25.90	26.20
Manure salts, 30 per cent K_2O	in bags	20.00	21.75	21.95	22.15
	in bulk	18.00	18.75	18.95	19.15
Kainite, 20 per cent K_2O	in bags	13.35	15.40	15.50	15.65
	in bulk	11.35	12.40	12.50	12.65
Kainite, 14 to 16 per cent K_2O	in bags	10.50	12.50	12.60	12.70
	in bulk	8.50	9.50	9.60	9.70
Kainite, 12.4 per cent K_2O	in bags	10.00	12.00	12.10	----------
	in bulk	8.00	9.00	9.10	----------

The same discounts were offered beginning May 1, 1930, as prevailed in 1929, as follows: On orders placed prior to June 1 for prompt shipment, 9 per cent; prior to June 1 for shipment in equal monthly quantities June to September, inclusive, 8 per cent; July 1 for July shipment, 7 per cent; August 1 for August shipment, 6 per cent; September 1 for September shipment, 5 per cent; October 1 for October shipment, 4 per cent; November 1 for November shipment, 3 per cent; December 1 for December shipment, 2 per cent. Bagged salts are sold on foreign weights, tares, and analyses and bulk salts on American weights and foreign analyses.

SUMMARY OF WORLD PRODUCTION

The following table, compiled by L. M. Jones, of the Bureau of Mines, lists the countries that in the last five years have produced potassium salts and gives the available figures for their production of crude salts and K_2O equivalent. The list of countries differs somewhat from that given in the table of imports, because in that table some of the countries from which the imports came were not themselves producers but received their supply from other countries. Both tables, however, clearly show the predominance of Germany and Alsace as producers of potash.

World production of potash minerals and equivalent K_2O, 1926–1930, in metric tons

Country and mineral[1]	1926		1927		1928		1929		1930	
	Output	Equivalent K_2O	Output	Equivalent K_2O	Output	Equivalent K_2O	Output	Equivalent K_2O	Output	Equivalent K_2O
Australia:										
New South Wales, alunite	589	51	----------	----------	----------	----------	----------	----------	----------	----------
Western Australia, alunite	----------	----------	----------	----------	----------	----------	39	(2)	(2)	(2)
Chile, perchlorate of potash[3]	121	(2)	101	(2)	297	(2)	1, 259	(2)	(2)	(2)
Ethiopia, crude salts	1, 635	(2)	1, 600	800	1, 300	650	(2)	(2)	(2)	(2)
France (Alsace), crude salts	2, 316, 546	[4] 366, 670	2, 321, 757	[4] 370, 901	2, 580, 196	[4] 406, 640	3, 124, 816	[4] 493, 934	3, 133, 785	[4] 496, 488
Germany, crude salts:										
Carnallite[5]	1, 867, 129	181, 917	1, 773, 195	171, 208	2, 057, 760	200, 488	2, 317, 940	222, 506	(2)	(2)
Kainite, sylvinite, and hartsalz	7, 540, 980	1, 080, 672	9, 298, 346	1, 346, 829	10, 431, 310	1, 490, 640	10, 998, 278	1, 565, 269	(2)	(2)
India (British), nitrate of potash[6]	5, 800	2, 000	6, 900	3, 000	4, 800	2, 000	4, 900	2, 000	(2)	(2)
Italy:										
Alunite	1, 600	180	800	90	185	19	105	11	825	(2)
Leucite rock	35, 000	2, 800	29, 000	2, 300	39, 200	3, 200	37, 727	(2)	41, 200	(2)
Poland:										
Kainite	79, 166	7, 917	127, 772	12, 772	146, 692	14, 669	137, 858	14, 062	100, 783	10, 078
Sylvinite	128, 523	31, 025	148, 340	31, 053	194, 964	40, 942	220, 770	49, 673	204, 826	(2)
Russia:[7]										
Alum stone	647	(2)	1, 364	(2)	1, 131	(2)	(2)	(2)	(2)	(2)
Alunite clays	3, 305	(2)	3, 065	(2)	1, 812	(2)	(2)	(2)	(2)	(2)
Carbonate of potash[8]	3, 265	(2)	3, 784	(2)	6, 057	(2)	6, 980	(2)	(2)	(2)
Spain:										
Crude salts	80, 598	11, 687	172, 356	17, 236	243, 233	24, 323	243, 949	24, 395	(2)	(2)
Potassic earth	950	(2)	950	(2)	850	(2)	850	(2)	(2)	(2)
United States, crude salts	42, 024	21, 197	69, 689	39, 471	94, 464	54, 349	97, 812	55, 373	95, 989	55, 583

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[1] In addition to the countries listed Queensland produced 6 tons of alunite in 1927, but working expenses equaled returns and operations were discontinued.

[2] Data not available.

[3] Produced at nitrate plants from caliche.

[4] Figures relate to merchantable products.

[5] Includes some natural kieserite.

[6] Estimated production (Imperial Institute, London).

[7] Year ended Sept. 30.

[8] Made from sunflower ash. The deposits of Solikamsk not on a producing basis during the period under discussion.

FULLER'S EARTH [1]

By Jefferson Middleton

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GENERAL CONDITIONS

The fuller's earth industry continued to show progress in 1930 despite the slower pace of general business throughout the year as compared with that in 1929. Although sales of fuller's earth declined in the far West the total domestic product sold or used by producers in the United States, which has increased steadily since 1921, reached a maximum in 1930. The increase in quantity sold or used by producers in 1930 compared with 1929 was 19,661 short tons, or 6 per cent; the increase in total value was small—$16,982, or less than one-half of 1 per cent. The increase in quantity sold or used by producers in 1930 compared with 1920 was 207,157 tons, or 161 per cent; the increase in total value during the same period was $1,820,516, or 73 per cent. The average value per ton in 1930 was $12.89, a decrease of 75 cents compared with 1929. The quantity of fuller's earth imported in 1930 decreased 13 per cent, compared with 1929, but its value increased 3 per cent. The apparent consumption of fuller's earth in the United States in 1930 was about 329,000 tons. The domestic earth used constituted 98 per cent of this total.

The rates of duty on fuller's earth were unchanged by the tariff act of 1930; they are as follows: "Fuller's earth, unwrought and unmanufactured, $1.50 per [long] ton; wrought or manufactured, $3.25 per [long] ton."

OCCURRENCE

Occurrences of fuller's earth have been reported in Alabama, Arizona, Arkansas, California, Colorado, Florida, Georgia, Illinois, Maryland, Massachusetts, Minnesota, Mississippi, Missouri, Nebraska, Nevada, New York, Pennsylvania, South Carolina, South Dakota, Texas, Utah, Virginia, and Washington; in 1930 it was produced only in Colorado, Florida, Georgia, Illinois, Massachusetts, Nevada, and Texas.

USES

Fuller's earth is used mainly as a filtering medium in clarifying or bleaching fats, greases, and mineral and vegetable oils. Its original use was in fulling woolen cloth, and from that it derived its name; such use, at least in this country, has been virtually abandoned.

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[1] Work on manuscript completed June, 1931.

To within the past few years the term "fuller's earth" was applied only to claylike materials that possess the property of bleaching, clarifying, decolorizing, or filtering mineral and vegetable oils and animal fats and greases; however, material discovered in recent years in the far West, which is of a different character but is said to be of excellent quality for filtering or clarifying oils, has been included in the figures in this series of reports.

PRODUCTION

Fuller's earth sold or used by producers in the United States, 1921–1930

Year	Operators reporting sales	Short tons	Value at mines		Year	Operators reporting sales	Short tons	Value at mines	
			Total	Average				Total	Average
1921	12	105,609	$1,973,848	$18.69	1926	14	234,152	$3,356,482	$14.33
1922	15	138,944	2,289,719	16.48	1927	16	264,478	3,767,038	14.24
1923	15	149,134	2,247,523	15.07	1928	17	287,012	3,895,991	13.57
1924	13	177,994	2,632,342	14.79	1929	17	315,983	4,309,723	13.64
1925	14	206,574	2,923,965	14.15	1930	15	335,644	4,326,705	12.89

Because of the small number of producers in most of the producing States it is impossible to publish totals for these States without revealing confidential data. The 1930 output increased in comparison with that in 1929 in three States—Colorado, Georgia, and Texas—but decreased in Florida, Illinois, Massachusetts, and Nevada. The South continues to lead in the sales of fuller's earth, Georgia, Florida, and Texas, named in the order of their relative importance, reporting 82 per cent of the total, compared with 76 per cent in 1929. In 1930, as in the preceding six years, Georgia was the leading State in quantity and value. Florida was again second, and Texas was third, the latter displacing Nevada which had been third for several years. The only State for which figures for 1930 may be published is Texas. It reported 45,503 short tons in 1930, valued at $443,477, or $9.75 a ton, compared with 34,249 tons in 1929, valued at $322,215, or $9.41 a ton. The 1930 figures show a gain of 33 per cent in quantity and of 38 per cent in total value.

The following table shows the output of fuller's earth from 1927 to 1930, by uses, as reported by producers.

Fuller's earth sold or used by producers in the United States, 1927–1930, by uses

Year	Bleaching, clarifying, decolorizing, or filtering—				Miscellaneous uses		Total (short tons)
	Mineral oils		Vegetable oils and animal fats				
	Short tons	Percentage of total	Short tons	Percentage of total	Short tons	Percentage of total	
1927	243,009	91.9	15,363	5.8	6,106	2.3	264,478
1928	258,645	90.1	24,288	8.5	4,079	1.4	287,012
1929	301,607	95.4	10,685	3.4	3,691	1.2	315,983
1930	326,087	97.1	8,350	2.5	1,207	.4	335,644

IMPORTS AND EXPORTS

Imports of fuller's earth, which at one time constituted the entire supply in the United States, were increasing before the World War and reached their maximum in 1914, but since that time the general trend has been downward. Of the decade covered by the following table, 1922, 1925, 1926, and 1929 showed appreciable increases. Imports in 1930 declined 1,044 tons, or 13 per cent, compared with 1929; the value of imports increased $4,088, or 3 per cent. The quantity imported in 1930 was only 38 per cent of the tonnage imported in 1920 and only 29 per cent of that in 1914. In 1930 wrought or manufactured earth constituted 94 per cent of the total quantity and 96 per cent of the total value of the imported fuller's earth.

Exports of fuller's earth are not shown in the official records of the foreign commerce of the United States, but seven operators reported to the Bureau of Mines that in 1930 they exported 14,237 short tons of fuller's earth to Argentina, Belgium, Canada, Canary Islands, Cuba, Denmark, England, Germany, Mexico, Poland, Russia, and Sweden. This tonnage represents a decrease of 33 per cent compared with 1929.

Fuller's earth imported for consumption in the United States, 1921–1930 [1]

Year	Unwrought or unmanufactured		Wrought or manufactured		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1921	483	$6,172	9,261	$113,243	9,744	$119,415
1922	607	7,413	9,962	128,282	10,569	135,695
1923	642	8,252	7,905	105,692	8,547	113,944
1924	296	3,385	7,006	89,103	7,302	92,488
1925	215	2,619	7,800	108,676	8,015	111,295
1926	158	2,290	8,940	121,384	9,098	123,674
1927	550	5,679	7,030	103,602	7,580	109,281
1928	354	6,710	7,239	125,293	7,593	132,003
1929	608	11,583	7,694	140,849	8,302	152,432
1930	409	5,805	6,849	150,715	7,258	156,520

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[1] Compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

SALT, BROMINE, AND CALCIUM CHLORIDE[1]

By A. T. Coons

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SALT

PRODUCTION

Salt produced for sale or use by operators of salt mines, wells, and ponds in the United States in 1930 amounted to 8,054,440 short tons, valued at $25,009,480—a decrease of 6 per cent in quantity and 8.5 per cent in value in comparison with 1929. The output of evaporated salt in 1930—2,358,610 tons, valued at $16,544,871—represented 29 per cent of the total quantity of salt produced and showed a decrease of 7 per cent in quantity and 8 per cent in value compared with 1929. The salt content (3,718,460 tons) of the brine produced and used by producers in the manufacture of chemicals represented 46 per cent of the total salt produced and showed a decrease of 4 per cent in quantity. Rock salt produced—1,977,370 tons, valued at $6,391,775—represented 25 per cent of the total output and showed a decrease of 6 per cent in quantity and 10 per cent in value. The average value of all salt was $3.11 a short ton in 1930—9 cents less than in 1929; that of evaporated salt, including pressed blocks from evaporated salt, was $7.01—3 cents less than in 1929; while the average value of rock salt was $3.23 a ton, or 14 cents less than in 1929.

Seventy-seven plants reported operations in 1930 as compared with 78 in 1929 and 104 in 1920.

Salt sold or used by producers in the United States, 1921–1930

Year	Short tons				Value[a]	
	Manufactured (evaporated)	In brine	Rock salt	Total	Total	Average
1921	1,931,243	1,577,335	1,472,576	4,981,154	$24,557,966	$4.93
1922	2,276,683	2,569,042	1,947,124	6,792,849	27,464,838	4.04
1923	2,239,872	2,787,239	2,103,602	7,130,713	27,795,941	3.90
1924	2,224,555	2,513,853	2,064,707	6,803,115	25,747,048	3.78
1925	2,235,170	2,819,690	2,342,640	7,397,500	26,162,361	3.54
1926	2,198,060	3,037,820	2,135,720	7,371,600	25,055,012	3.40
1927	2,263,030	3,161,800	2,143,860	7,568,690	24,817,962	3.28
1928	2,430,050	3,426,870	2,217,780	8,074,700	26,772,568	3.32
1929	2,546,390	3,884,160	2,113,010	8,543,560	27,334,695	3.20
1930	2,358,610	3,718,460	1,977,370	8,054,440	25,009,480	3.11

[a] The values are f. o. b. mine or refinery and do not include cost of cooperage or containers.

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[1] Work on manuscript completed May, 1931.

Salt sold or used by producers in the United States, 1927–1930, by States

State	1927		1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
California	300,880	$1,827,750	383,730	$2,292,296	410,300	$2,432,329	350,370	$2,080,133
Kansas	794,780	2,971,544	821,950	3,573,982	840,370	3,761,984	759,800	3,148,728
Louisiana	606,110	2,167,220	630,780	2,405,351	525,840	2,277,366	535,250	2,164,365
Michigan	2,271,460	7,551,552	2,405,240	8,249,437	2,650,220	8,343,607	2,558,290	7,884,072
New York	1,964,080	6,121,461	2,085,230	6,400,933	2,194,590	6,470,051	2,009,280	5,837,103
Ohio	1,203,170	3,130,236	1,308,110	2,988,862	1,449,360	3,199,903	1,311,440	3,015,206
Porto Rico	15,150	28,920	----------	----------	(1)	(1)	(1)	(1)
Texas	54,270	399,171	(1)	(1)	(1)	(1)	(1)	(1)
Utah	74,690	334,732	85,800	193,582	84,940	202,676	85,240	188,983
West Virginia	22,600	167,155	18,700	149,421	20,290	153,477	28,670	184,327
Undistributed [2]	261,500	118,221	335,160	518,704	367,650	493,302	416,100	506,563
	7,568,690	24,817,962	8,074,700	26,772,568	8,543,560	27,334,695	8,054,440	25,009,480

[1] Included under "Undistributed."

[2] 1927, Arizona, Nevada, New Mexico, Oklahoma, and Virginia; 1928, Arizona, Nevada, New Mexico, Oklahoma, Texas, and Virginia; 1929 and 1930, Nevada, New Mexico, Oklahoma, Porto Rico, Texas, and Virginia.

Salt sold or used by producers in the United States, 1929 and 1930, by methods of manufacture

Method of manufacture	1929		1930	
	Short tons	Value	Short tons	Value
Evaporated in open pans or grainers	771,400	$6,597,434	707,330	$6,355,341
Evaporated in vacuum pans	1,201,560	8,414,636	1,163,630	7,875,537
Solar evaporated	401,310	1,517,425	353,080	1,234,621
Pressed blocks from evaporated salt	172,120	1,392,427	134,570	1,079,372
Rock	2,072,090	6,796,284	1,935,220	6,157,422
Pressed blocks from rock salt	40,920	331,397	42,150	234,353
Salt in brine (sold or used as such)	3,884,160	2,285,092	3,718,460	2,072,834
	8,543,560	27,334,695	8,054,440	25,009,480

New York, Louisiana, Kansas, and Michigan together produced more than 98 per cent of the rock salt mined in 1930.

Rock salt sold by producers in the United States, 1921–1930

Year	Short tons	Value	Year	Short tons	Value
1921	1,472,576	$6,693,923	1926	2,135,720	$7,234,757
1922	1,947,124	7,489,644	1927	2,143,860	6,376,355
1923	2,103,602	7,843,419	1928	2,217,780	6,923,827
1924	2,064,707	7,501,419	1929	2,113,010	7,127,681
1925	2,342,640	7,444,799	1930	1,977,370	6,391,775

Evaporated salt sold or used by producers in the United States, 1929 and 1930, by States

State	1929		1930	
	Short tons	Value	Short tons	Value
California	385,350	$2,317,533	329,430	$1,990,397
Kansas	306,740	2,282,043	286,960	2,016,541
Michigan	1,025,880	6,960,712	944,200	6,544,793
New York	355,350	3,529,185	330,500	3,225,003
Ohio	303,000	2,053,541	301,400	2,005,163
West Virginia	20,290	153,477	28,670	184,327
Undistributed [1]	149,780	625,431	137,450	578,647
	2,546,390	17,921,922	2,358,610	16,544,871

[1] 1929, Louisiana, New Mexico, Oklahoma, Porto Rico, Texas, and Utah; 1930, Louisiana, Nevada, New Mexico, Oklahoma, Porto Rico, Texas, and Utah.

Sales of pressed blocks from evaporated salt and rock salt, reported by producers, decreased 17 per cent in quantity and 24 per cent in value in 1930 as compared with 1929. Sales of pressed blocks from evaporated salt decreased 22 per cent in both quantity and value, and sales of pressed blocks from rock salt increased 3 per cent in quantity but decreased 29 per cent in value. The production of these blocks from both evaporated salt and rock salt, as reported by the original producers of the salt and shown in the following table, does not represent the entire pressed-block industry, as some firms that do not produce salt make pressed blocks from salt bought in the open market. Pressed blocks from evaporated salt are made chiefly by salt producers in Kansas and Michigan but are also produced in Texas, Utah, Ohio, and California. Pressed blocks from rock salt are made chiefly by salt producers in Kansas and Louisiana, and small amounts are made in Utah and New York.

Pressed salt blocks sold by original producers of the salt in the United States, 1921–1930

Year	From evaporated salt		From rock salt		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1921	97,591	$1,106,239	20,148	$169,244	117,739	$1,275,483
1922	134,089	1,309,255	38,593	245,174	172,682	1,554,429
1923	128,073	1,263,246	38,043	281,302	166,116	1,544,548
1924	135,720	1,059,484	36,624	263,260	172,344	1,322,744
1925	135,480	1,069,685	35,730	206,818	171,210	1,276,503
1926	125,670	1,038,292	28,870	196,414	154,540	1,234,706
1927	150,140	1,251,022	34,420	230,048	184,560	1,481,070
1928	145,720	1,205,794	34,930	293,626	180,650	1,499,420
1929	172,120	1,392,427	40,920	331,397	213,040	1,723,824
1930	134,570	1,079,372	42,150	234,353	176,720	1,313,725

IMPORTS AND EXPORTS[2]

Imports of salt into the United States in 1930—54,021 short tons—showed a gain of 48 per cent as compared with 1929. There has been, however, a general decrease in the imports of salt since 1922, when they amounted to 113,922 tons. The gain in 1930 was due chiefly to the large increase in salt imported for curing fish.

Exports of salt amounted to 70,478 short tons in 1930—35 per cent less than in 1929 and the smallest exports since 1913 (70,289 tons).

Salt imported for consumption in the United States, 1921–1930

Year	Used for curing fish		In bags, barrels, and other packages		In bulk		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1921	([a])	([a])	[a] 38,374	[a] $333,282	54,721	$197,749	93,095	$531,031
1922	2,252	$5,549	22,140	211,169	89,530	305,620	113,922	522,338
1923	16,472	46,260	19,713	194,710	52,565	142,288	88,750	383,258
1924	27,096	61,581	13,330	148,060	48,512	114,451	88,938	324,092
1925	17,976	51,332	8,997	137,580	58,815	127,915	85,788	316,827
1926	24,310	50,915	4,698	87,441	26,956	63,887	55,964	202,243
1927	25,048	55,054	3,725	70,182	16,195	42,439	44,968	167,675
1928	14,710	34,777	3,605	52,877	24,541	61,905	42,856	149,559
1929	8,812	23,258	4,385	48,353	23,253	60,105	36,450	131,716
1930	25,176	49,212	5,811	45,682	23,034	49,059	54,021	143,953

[a] Salt imported for curing fish included with salt imported "in bags, barrels, and other packages."

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[2] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Salt imported into the United States, 1927–1930, by countries

[General imports]

Country	1927		1928		1929		1930	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
North America:								
Canada	430, 246	$1, 625	1, 332, 557	$5, 470	2, 051, 172	$7, 697	4, 694, 546	$13, 524
Mexico	20, 000	98	4, 743, 659	12, 940	990, 000	1, 485	----------	--------
West Indies—								
British—								
Jamaica	10, 616, 050	14, 634	23, 137, 510	25, 914	23, 550, 823	28, 806	33, 590, 912	38, 555
Other British	4, 952, 170	6, 041	15, 911, 627	18, 107	16, 971, 389	22, 837	5, 114, 460	6, 460
Dominican Republic	67, 500	163	----------	--------	----------	--------	----------	--------
French	389, 000	944	125, 200	377	----------	--------	----------	--------
Netherland	6, 031, 594	9, 541	1, 497, 655	2, 362	2, 444, 416	4, 186	4, 200, 478	6, 546
South America: Peru	1, 036	38	----------	--------	----------	--------	----------	--------
Europe:								
France	----------	--------	----------	--------	79	20	88	35
Germany	1, 692, 501	8, 465	2, 909, 598	11, 403	4, 110, 616	12, 457	2, 570, 185	9, 922
Greece	----------	--------	11, 108	121	----------	--------	----------	--------
Italy	14, 874, 000	12, 068	----------	--------	----------	--------	----------	--------
Netherlands	----------	--------	828	75	----------	--------	56, 000	338
Spain	49, 024, 640	49, 666	28, 560, 000	28, 578	34, 955, 200	36, 606	54, 185, 600	43, 798
Switzerland	22	5	----------	--------	----------	--------	----------	--------
United Kingdom	7, 208, 548	64, 241	5, 819, 163	44, 344	6, 438, 636	37, 570	4, 117, 704	26, 366
Asia: Japan	1, 070	21	----------	--------	----------	--------	----------	--------
Africa: Portuguese	536, 000	970	----------	--------	163, 000	99	----------	--------
	95, 844, 377	168, 520	84, 048, 905	149, 691	91, 675, 331	151, 763	108, 529, 973	145, 544

Salt exported from the United States, 1921–1930

Year	Short tons	Value	Year	Short tons	Value
1921	109, 563	$1, 415, 471	1926	158, 908	$1, 277, 790
1922	134, 989	1, 429, 172	1927	153, 832	1, 329, 980
1923	125, 529	1, 211, 226	1928	145, 396	1, 185, 682
1924	144, 945	1, 288, 376	1929	109, 222	1, 008, 842
1925	155, 079	1, 219, 935	1930	70, 478	715, 575

Salt exported from the United States, 1927–1930, by countries

Country	1927		1928		1929		1930	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
North America:								
Bermudas	158, 027	$2, 411	100, 460	$1, 935	104, 832	$1, 285	183, 366	$2, 214
British Honduras	676, 601	4, 363	865, 495	4, 965	717, 898	5, 224	812, 883	5, 859
Canada	219, 434, 815	744, 932	223, 256, 071	736, 007	172, 298, 827	570, 921	100, 194, 835	348, 758
Central American States—								
Costa Rica	147, 060	2, 045	161, 749	1, 912	323, 709	3, 187	81, 998	1, 368
Guatemala	602, 815	4, 618	603, 386	5, 135	1, 147, 823	8, 482	323, 652	2, 723
Honduras	4, 674, 156	33, 025	3, 706, 772	24, 516	2, 046, 741	17, 632	2, 639, 429	21, 351
Nicaragua	1, 112, 967	11, 190	998, 931	10, 298	749, 505	11, 672	710, 926	8, 299
Panama	1, 470, 556	13, 571	1, 631, 501	12, 862	1, 577, 504	15, 340	1, 779, 321	15, 635
Salvador	3, 048	47	548	19	886	29	2, 284	120
Mexico	17, 196, 038	144, 557	11, 785, 593	110, 712	9, 066, 490	99, 606	9, 611, 239	94, 460
Miquelon, Langley, etc	2, 616	67	2, 558	75	2, 976	108	----------	--------
Newfoundland and Labrador	----------	--------	48, 925	511	639, 010	3, 253	494, 490	2, 462
West Indies—								
British—								
Jamaica	67, 997	537	172	12	2, 400	72	6, 107	191
Trinidad and Tobago	----------	--------	----------	--------	1, 400	19	4, 480	57
Other British	70, 414	737	8, 534	366	14, 068	558	13, 549	398
Cuba	56, 029, 595	280, 566	40, 217, 746	168, 484	20, 703, 211	138, 955	16, 648, 042	104, 524
Dominican Republic	187, 278	1, 731	27, 886	818	69, 705	1, 649	61, 183	1, 289
French	----------	--------	600, 000	900	----------	--------	643, 860	1, 863
Haiti	10, 307	376	12, 235	398	7, 328	250	10, 730	384
Netherland	5, 445	103	15, 815	241	129, 304	1, 724	115, 589	829
Virgin Islands of the United States	27, 393	233	812, 000	742	629, 732	2, 557	1, 000	34

Salt exported from the United States, 1927–1930, by countries—Continued

Country	1927		1928		1929		1930	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
South America:								
Argentina	2,072	$99	133,761	$1,785	5,428	$216	4,303	$101
Bolivia	50	4	--------	--------	--------	--------	720	28
Brazil	--------	--------	--------	--------	17,444	1,152	5,501	332
Chile	2,448	105	4,700	163	4,800	186	13,858	876
Colombia	139,746	1,740	68,596	1,225	62,850	1,304	267,484	2,526
Ecuador	3,654	566	2,393	79	1,164	109	804	58
Guiana—								
British	--------	--------	--------	--------	--------	--------	200	3
Surinam	330	14	--------	--------	192	4	2,000	14
Paraguay	2,450	89	2,400	90	600	15	84	4
Peru	--------	--------	--------	--------	550	55	340	4
Venezuela	900	16	30,000	176	52,610	446	5,045	72
Europe:								
Denmark	--------	--------	3,185	166	600	40	7,215	277
Finland	--------	--------	--------	--------	--------	--------	3,900	135
France	8,000	72	10.060	81	14,136	221	16,940	322
Germany	110,380	1,015	92,215	800	--------	--------	--------	--------
Iceland and Faroe Islands	--------	--------	--------	--------	12,544	892	--------	--------
Irish Free State	--------	--------	--------	--------	1,000	38	878	31
Italy	--------	--------	--------	--------	124	3	--------	--------
Netherlands	7,531	27	10,342	39	7,609	82	5,298	40
Norway	400	21	--------	--------	--------	--------	1,339	61
Portugal	--------	--------	--------	--------	1,000	26	--------	--------
Spain	--------	--------	--------	--------	--------	--------	4,601	232
Sweden	--------	--------	--------	--------	--------	--------	79,985	2,984
Turkey in Europe	330	11	--------	--------	--------	--------	--------	--------
United Kingdom	208,104	1,228	467,542	3,271	130,984	1,002	55,116	806
Asia:								
Ceylon	5,848	359	2,024	185	3,202	237	1,140	124
China	50,675	2,764	151,991	7,852	228,980	3,245	26,483	1,474
East Indies—								
British—								
India	16,266	710	6,045	780	5,398	450	4,732	377
Malaya	6,106	375	3,208	199	2,051	152	988	100
Netherland—								
Java and Madura	5,150	206	16,684	699	22,972	1,066	25,684	1,154
Other Netherland	120	14	2,492	79	6,168	364	6,016	280
Hong Kong	33,742	1,814	61,306	2,423	46.200	2,625	47,184	1,956
Indo-China, French	1,456	70	3,944	197	5,512	308	4,936	240
Iraq	--------	--------	208	10	--------	--------	--------	--------
Japan	431,042	1,920	398,046	3,860	827,643	6,981	502,432	3,994
Kwantung	3,355	248	5,400	407	7,606	326	12,370	487
Persia	172	11	--------	--------	864	41	--------	--------
Philippine Islands	236,730	7,289	313,293	9,742	388.567	8,650	365,433	8,956
Siam	4,270	370	4,382	400	3,160	246	3,424	271
Soviet Russia	101,500	471	170,000	1,242	150,300	1,207	--------	--------
Syria	4,520	132	--------	--------	16,000	525	10,920	358
Africa:								
British—								
East	--------	--------	--------	--------	120	4	--------	--------
Nigeria	--------	--------	--------	--------	--------	--------	120	14
South (Union of)	324	14	--------	--------	480	20	5,367	204
West	2,259	40	--------	--------	--------	--------	--------	--------
Liberia	123	38	2,259	38	--------	--------	--------	--------
Morocco	--------	--------	3,280	44	--------	--------	--------	--------
Portuguese ("Other")	120	12	--------	--------	--------	--------	--------	--------
Oceania:								
British—								
Australia	3,661,155	53.315	3,135,376	56,281	5,651,398	84,039	3,386,980	50.515
New Zealand	440,533	6,356	403,462	6,947	206,507	5,554	1,415,217	19,135
Other British	27,279	528	32,665	637	84,808	1,389	42,572	588
French	267,368	2,808	394,862	4,877	238,247	3,099	279,729	3,624
	307,663,636	1,329,980	290,792,498	1,185,682	218,443,167	1,008,842	140,956,301	715,575

TARIFF

The tariff on salt prior to 1913 was 11 cents per 100 pounds for salt in bags, barrels, sacks, or other packages and 7 cents per 100 pounds for salt in bulk. Salt for curing fish entered the United States free of duty. The tariff act of 1913 placed all grades of salt on the free list. The act of September, 1922, restored the duty ruling prior to 1913. This duty was not changed by the act of June, 1930.

WORLD PRODUCTION

World production of salt, 1925–1929, in metric tons

[Compiled by M. T. Latus, of the Bureau of Mines]

Country[1]	1925	1926	1927	1928	1929
North America:					
Canada	216,729	235,938	245,756	273,525	299,518
Cuba	(2)	(2)	411	2,359	14,515
Guatemala	57	4,805	225	(2)	(2)
Mexico[3]	67,000	67,000	67,000	67,000	67,000
Panama	(2)	1,280	1,149	835	(2)
United States—					
Rock salt	2,125,196	1,937,482	1,944,867	2,011,926	1,916,880
Other salt	4,585,668	4,749,886	4,921,297	5,313,281	5,833,666
West Indies—					
British—					
Bahamas[4]	1,312	7,476	1,923	725	813
Grenada (Windward Islands)[4]	71	56	----------	----------	----------
Leeward Islands[4]	802	614	1,214	1,586	(2)
Turks and Caicos Islands[4]	63,434	54,824	28,371	50,846	62,135
Netherland[4]	18,377	10,159	8,218	9,778	4,677
South America:					
Argentina[5]	75,351	96,655	153,213	167,617	197,799
Chile	29,334	34,903	71,549	34,746	37,422
Colombia[3]	29,000	29,000	29,000	29,000	29,000
Ecuador—					
Rock salt	(2)	(2)	628	333	69
Other salt	(2)	(2)	16,100	10,051	17,377
Peru	28,371	30,114	29,997	32,669	30,000
Venezuela	[3] 30,000	23,865	20,803	26,228	25,443
Europe:					
Albania	(2)	5,596	6,600	5,283	(2)
Austria—					
Rock salt	2,087	3,227	2,675	1,607	3,041
Other salt	128,720	141,914	145,405	152,212	175,442
Bulgaria—					
Rock salt	----------	----------	3,982	4,108	3,653
Other salt	10,400	14,000	30,980	31,682	12,000
Czechoslovakia	76,826	98,105	122,202	154,243	166,361
France—					
Rock salt and salt from springs	1,458,420	1,643,360	1,518,000	1,707,506	1,748,100
Other salt	262,008	467,610	432,500	407,768	324,600
Germany—					
Rock salt	1,767,282	1,965,847	2,268,807	2,399,669	2,541,489
Other salt	456,810	479,547	533,984	509,663	501,024
Greece	79,316	89,726	104,378	(2)	(2)
Italy—					
Rock salt	63,984	67,610	66,850	67,187	63,040
Other salt	851,653	698,642	984,124	836,201	873,295
Netherlands—Rock salt	34,053	34,505	40,596	41,858	[6] 45,247
Poland	429,988	457,503	498,435	548,377	569,488
Portugal[4]	33,744	49,404	49,552	46,777	15,317
Rumania—					
Rock salt	330,356	344,062	328,028	340,212	318,802
Other salt	448	----------	3	2,567	2,698
Russia[7]	1,377,624	1,685,717	2,216,136	2,548,106	(2)
Spain—					
Rock salt	106,627	118,581	110,839	146,147	164,837
Other salt	753,514	978,688	868,381	836,912	914,639
Switzerland	75,141	77,267	78,262	79,982	86,476
United Kingdom—					
Great Britain—					
Rock salt	35,281	35,152	22,809	24,254	28,786
Other salt	1,912,061	1,708,864	1,985,250	1,938,575	1,962,024
Ireland, Northern—					
Rock salt	10,052	6,191	7,262	7,598	7,954
Other salt	7,230	4,960	(2)	7,130	7,093
Yugoslavia	48,499	52,260	54,765	52,128	44,564
Asia:					
Ceylon	20,588	16,218	26,080	44,275	25,482
China (including Kwantung)	[8] 3,639,000	[3] 3,600,000	[8] 2,067,269	[3] 2,000,000	[3] 2,000,000
Cyprus[3]	3,000	3,000	3,000	3,000	3,000
India—					
British (including Aden)—					
Rock salt	152,794	149,025	173,489	157,846	181,164
Other salt	1,163,137	1,516,026	1,464,328	1,381,822	1,555,366
Portuguese[3]	12,000	12,000	12,000	12,000	12,000

[1] In addition to the countries listed salt is produced in Arabia, Bolivia, Brazil, Chosen, Gold Coast, Kenya Colony, Madagascar, and Southern Rhodesia, but figures of production are not available.

[2] Data not available.

[3] Estimated annual production.

[4] Exports.

[5] Railway shipments.

[6] Sales.

[7] Year ended Sept. 30.

[8] Figures of production as published by the Geological Survey of China, Peiping.

World production of salt, 1925–1929, in metric tons—Continued

Country	1925	1926	1927	1928	1929
Asia—Continued.					
Indo-China[4]	5,955	20,456	27,761	35,816	25,636
Japan—					
Japan proper[8]	668,647	614,134	619,138	637,888	644,151
Taiwan	138,000	135,232	113,400	134,515	181,723
Netherland East Indies	471,043	407,607	264,197	253,162	486,907
Palestine	5,600	(2)	7,014	1,654	2,508
Philippine Islands	30,683	24,075	66,669	71,475	46,876
Russia[7]	227,170	166,886	209,850	257,635	(2)
Siam	126,086	125,670	115,356	119,332	(2)
Turkey[3]	100,000	100,000	100,000	100,000	100,000
Africa:					
Algeria	27,005	43,216	36,936	10,975	15,305
Belgian Congo[3]	80	80	80	80	80
Egypt[4]	211,130	180,241	222,535	167,874	149,023
Eritrea	[3] 60,000	65,000	68,000	[3] 60,000	[3] 60,000
Ethiopia—Rock salt	(2)	(2)	25,000	20,000	10,000
Mauritania	4,500	4,500	4,300	4,000	[3] 4,000
Mauritius[3]	1,500	1,500	1,500	1,500	1,500
Morocco, French	3,500	1,200	(2)	(2)	(2)
Nigeria[3]	400	400	400	400	400
Portuguese West Africa (Angola)[3]	9,000	9,000	9,000	9,000	9,000
Somaliland—					
British[3]	15,000	15,000	15,000	15,000	15,000
French	[3] 15,000	[3] 15,000	18,444	39,000	38,972
South-West Africa—Rock salt	432	363	343	146	334
Sudan, Anglo-Egyptian	[10] 7,020	9,342	9,872	12,481	14,951
Tanganyika Territory	4,000	3,155	4,852	5,134	7,387
Tripolitania[3]	2,000	2,000	2,000	2,000	2,000
Tunisia	128,442	132,080	144,788	114,045	120,165
Uganda	1,399	1,743	2,049	2,067	2,280
Union of South Africa[11]	59,269	80,517	80,416	83,785	(2)
Oceania:					
Australia—					
South Australia	79,507	92,563	80,559	72,574	77,684
Victoria	[3] 40,000	[3] 40,000	36,503	52,181	(2)
Western Australia[3]	8,000	8,000	8,000	8,000	8,000

[2] Data not available.
[3] Estimated annual production.
[4] Exports.
[7] Year ended Sept. 30.
[8] Year ended Mar. 31 of year following that stated. The figures do not include output from salt beds which, though situated on Government beach lands, have no fixed areas.
[10] Shipments from Raiwaya field.
[11] Year ended June 30.

LOCALITIES PRODUCING SALT IN THE UNITED STATES IN 1930

The salt deposits in the United States that furnish salt for commercial purposes are, with the exception of small deposits used for local supply, confined to definite regions in the northeastern, south central, and western parts of the country. Michigan, New York, and Ohio, included in the first group, furnished 73 per cent of the total salt sold or used by producers in 1930 compared with 74 per cent in 1929. Kansas and Louisiana, in the central belt of States, are the next largest producers and California is chief among the Western States.

The salt is marketed as evaporated salt and as rock salt. Salt brine is drawn from wells by several chemical manufacturers, and the salt content is used by them in their manufacturing processes. Bittern water, or the residue from some of the salt works, is sold to chemical manufacturers for further treatment and for the recovery of bromine and calcium chloride.

The producing companies in 1930, the location of their plants, and the nature of the salt sold or used by them, as reported to the Bureau of Mines, are given by States on the following pages to furnish information often requested regarding the operation of salt properties.

CALIFORNIA

In California salt is obtained from sea water, from salt springs, lakes, etc., and rock salt. The greater part of the production is from the solar evaporation of sea water, especially along the shores of San Francisco Bay in Alameda and San Mateo Counties. Reports were received in 1930 from the following:

Alameda County:
  Alvarado—Leslie-California Salt Co. (address, 155 Montgomery Street, San Francisco); evaporated salt (open pans or grainers, solar, vacuum pans), pressed blocks from evaporated salt.
  Mount Eden—Oliver Salt Co. (address, 155 Montgomery Street, San Francisco); evaporated salt (open pans or grainers, solar). Plant operated by Leslie-California Salt Co.
  Mount Eden and Newark—Arden Salt Co. (address, Standard Oil Building, San Francisco); solar evaporation. Mount Eden plant abandoned in 1930.
  Newark—Morton Salt Co. (address, 208 West Washington Street, Chicago, Ill.); evaporated salt (solar, vacuum pans), pressed blocks from evaporated salt.
Inyo County: Keeler (Saline Valley)—Sierra Salt Corporation (address, 512 South Alameda Street, Los Angeles); solar evaporation.
Kern County: Saltdale (Ceneda)—Consolidated Salt Co. of California (address, Long Beach). On a playa known as Cane Lake; solar evaporation.
Los Angeles County: Long Beach (Anaheim Road)—Long Beach Salt Co.; solar evaporation.
Modoc County: Cedarville—Surprise Valley Salt Works; solar evaporation.
Monterey County: Moss Landing—Monterey Bay Salt Co.; solar evaporation.
San Bernardino County:
  Amboy (Saltus)—California Rock Salt Co. (address, 2465 Hunter Street, Los Angeles); rock salt, also calcium chloride from Amboy playa.
  ——— Saline Products (Inc.) (address, 2000 Santa Fe Avenue, Los Angeles); rock salt, also calcium chloride.
San Diego County: San Diego (south end of San Diego Bay)—Western Salt Co.; solar evaporation.
San Mateo County:
  Leslie—Leslie-California Salt Co. (address, 155 Montgomery Street, San Francisco); evaporated salt (solar, vacuum pans), pressed blocks from evaporated salt.
  Redwood City—Stauffer Chemical Co. (address, 636 California Street, San Francisco); solar evaporation.
Santa Clara County: Alviso—Alviso Salt Co. Sales from stock. Plant abandoned in 1930.

A considerable quantity of bitterns or waste water from the salt plants is used by chemical plants in the manufacture of magnesium chloride, other magnesium salts, and insulating material. Iodine is extracted from brine obtained from oil wells.

KANSAS

In 1930 Kansas again ranked fourth among the salt-producing States. The salt sold in the State is rock salt and evaporated salt made from brines obtained from solution of rock salt. The companies reporting in 1930 were as follows:

Ellsworth County:
  Kanopolis—Crystal Salt Co. (address, Equitable Building, Denver, Colo.); rock salt.
  ——— Independent Salt Co. (address, 33 South Clark Street, Chicago, Ill.); rock salt.
Harper County: Anthony—Western Ice & Utilities Co.; evaporated salt (open pans or grainers), pressed blocks from evaporated salt, rock salt, pressed blocks from rock salt.

Reno County:
Hutchinson—The Barton Salt Co.; evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
——— The Carey Salt Co. (east plant); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
——— ——— (rock salt mine); rock salt, pressed blocks from rock salt.
——— Morton Salt Co. (address, 208 West Washington Street, Chicago, Ill.); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
Rice County:
Lyons—American Salt Corporation (address, La Salle Building, Kansas City, Mo.); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt, rock salt, pressed blocks from rock salt.
——— Diamond Crystal Salt Co. (address, 250 Park Avenue, New York, N. Y.); evaporated salt (vacuum pans), pressed blocks from evaporated salt, rock salt, pressed blocks from rock salt.
Sterling—Sterling Salt Co.; evaporated salt (open pans or grainers). Idle in 1930.

LOUISIANA

Louisiana in 1930 again ranked fifth in quantity of salt produced. Rock salt and evaporated salt are produced. The firms reporting in 1930 were:

Iberia Parish:
Avery Island—Avery Rock Salt Mining Co. (address, Scranton, Pa.); rock salt.
Jefferson Island—Jefferson Island Salt Mining Co. (Inc.) (address, Columbia Building, Louisville, Ky.); rock salt, pressed blocks from rock salt.
Weeks Island—Myles Salt Co. (Ltd.) (address, 1007 Camp Street, New Orleans); rock salt, pressed blocks from rock salt.
St. Martin Parish: Lafayette—Star Salt Corporation; evaporated salt (vacuum pans). Plant abandoned in 1930.
Winn Parish: Winnfield—The Carey Salt Co. (address, Hutchinson, Kans.) reported the development of salt deposits near Winnfield but made no commercial output.

MICHIGAN

Michigan in 1930 again ranked first among the salt-producing States. The output is obtained from both rock salt and natural brine. In 1930 reports were received from the following companies:

Bay County: Bay City—Halverson Lumber & Salt Co.; evaporated salt (grainers). Idle in 1930.
Manistee County: Manistee—Ruggles & Rademaker Co.; evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt, also bromine.
Mason County: Ludington—Morton Salt Co. (address, 208 West Washington Street, Chicago, Ill.); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
Midland County: Midland—The Dow Chemical Co.; evaporated salt (vacuum pans), also bromine, magnesium chloride, and calcium chloride.
Saginaw County:
Carrollton—Mershon, Eddy, Parker Co. (address, Saginaw); evaporated salt (open pans or grainers).
——— Saginaw Salt Products Co. (address, Saginaw); evaporated salt (open pans or grainers).
Saginaw—Strable Lumber & Salt Co.; evaporated salt (open pans or grainers).
St. Clair County:
Marine City—Michigan Salt Works; evaporated salt (open pans or grainers, vacuum pans). Operated by the Morton Salt Co. in January, 1930; idle remainder of year.
Port Huron—Morton Salt Co. (address, 208 West Washington Street, Chicago, Ill.); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
St. Clair—Diamond Crystal Salt Co. (address, 250 Park Avenue, New York, N. Y.); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.

Wayne County:
  Delray—The Solvay Process Co. (address, Syracuse, N. Y.); brine for the manufacture of chemicals.
  Detroit—Detroit Rock Salt Co. (address, Scranton, Pa.); rock salt.
  ——— Mulkey Salt Co.; evaporated salt (open pans or grainers, vacuum pans). Idle in 1930.
  Ecorse—Worcester Salt Co. (address, 71 Murray Street, New York, N. Y.); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
  Wyandotte—Michigan Alkali Co.; brine for the manufacture of chemicals.
  ——— Pennsylvania Salt Manufacturing Co. (address, Widener Building, Philadelphia, Pa.); evaporated salt (open pans or grainers), brine for the manufacture of chemicals.

NEVADA

In 1930 the Virgin River Salt Co. produced small quantities of rock salt at St. Thomas, Clark County, and the Nevada Pure Salt Co. produced solar salt at Fallon, Churchill County.

NEW MEXICO

Production of salt in 1930 was reported near Willard, Torrance County, by the New Mexico Salt Co.

NEW YORK

New York in 1930 again ranked second among the salt-producing States. Both evaporated and rock salt are supplied by producers, but the entire product is from rock salt. Brine for evaporated salt is obtained by dissolving the rock salt with water that is allowed to flow into the beds and is pumped out when saturated. The producing companies in 1930 were as follows:

Livingston County:
  Cuylerville (Halite)—Sterling Salt Co. (address, 40 West Fortieth Street, New York); rock salt, pressed blocks from rock salt. Succeeded in May, 1930, by the Retsof Mining Co.
  Cuylerville (Halite) and Retsof—Retsof Mining Co. (address, Scranton, Pa.); rock salt.
  Piffard—Worcester Salt Co. (address, 71 Murray Street, New York); evaporated salt (open pans or grainers, vacuum pans).
Onondaga County: Solvay and Tully—The Solvay Process Co. (address, Syracuse); evaporated salt (vacuum pans), brine for the manufacture of chemicals and refined salt as a by-product.
Schuyler County:
  Watkins Glen—International Salt Co. (address, Scranton, Pa.); evaporated salt (open pans or grainers, vacuum pans).
  ——— The Watkins Salt Co.; evaporated salt (open pans or grainers, vacuum pans).
Tompkins County:
  Ludlowville—International Salt Co. (address, Scranton, Pa.); evaporated salt (open pans or grainers, vacuum pans).
  Myers—Cayuga Rock Salt Co. (Inc.); rock salt.
Wyoming County: Silver Springs—Worcester Salt Co. (address, 71 Murray Street, New York); evaporated salt (open pans or grainers, vacuum pans).

OHIO

Ohio in 1930 again ranked third in production of salt. The larger part of the output is used in the form of brine for the manufacture of chemicals.

Cuyahoga County: Cleveland—The Union Salt Co.; evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
Lake County: Painesville—Diamond Alkali Co. (address, 436 Seventh Avenue, Pittsburgh, Pa.); brine for the manufacture of chemicals.

Meigs County:
  Minersville—Pomeroy Salt Corporation (address, Pomeroy); evaporated salt (open pans or grainers), also bromine and calcium chloride.
  Pomeroy—The Excelsior Salt Works; evaporated salt (open pans or grainers), also bromine and calcium chloride.
Summit County:
  Barberton—Pittsburgh Plate Glass Co. (Columbia chemical plant); brine for the manufacture of chemicals.
  Kenmore—The Colonial Salt Co. (address, Akron); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.
Wayne County: Rittman—The Ohio Salt Co. (address, Wadsworth); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.

OKLAHOMA

Evaporated salt is taken from playas and lagoons and used locally as cattle salt; in 1930 C. O. Carpenter and Y. L. Stockman each reported sales of small amounts of such salt from near Vinson, Harmon County.

PORTO RICO

In 1930 two plants reported production, as follows:

Cabo Rojo—F. Carrera & Hno. (address, Mayaguez); solar evaporation.
Lajas—Miguel Antonio Ramirez Dominguez (address, San German); solar evaporation.

TEXAS

Salt was produced in Texas in 1930 as follows:

Anderson County: Palestine—Palestine Salt & Coal Co.; evaporated salt (open pans or grainers), pressed blocks from evaporated salt.
Van Zandt County: Grand Saline—Morton Salt Co. (address, 208 West Washington Street, Chicago, Ill.); evaporated salt (open pans or grainers, vacuum pans), pressed blocks from evaporated salt.

Salt formed by the evaporation of the waters of playas and lagoons is also used locally by cattlemen but there is no record of the quantity so used.

UTAH

Production of salt in Utah in 1930 was reported by the following companies:

Salt Lake County: Saltair—Royal Crystal Salt Co. (address, 133 Regent Street, Salt Lake City); solar evaporation, pressed blocks from evaporated salt.
Sanpete County: Axtell—Royal Crystal Salt Co. (address, 133 Regent Street, Salt Lake City); rock salt.
Sevier County:
  Redmond—Great Western Salt Co.; rock salt, pressed blocks from rock salt.
  ———Paulson Bros.; rock salt.
Tooele County: Burmester—Morton Salt Co. (address, 208 West Washington Street, Chicago, Ill.); solar evaporation, pressed blocks from evaporated salt.

VIRGINIA

Salt brine is produced in Virginia at Saltville, Smyth County, by the Mathieson Alkali Works (Inc.) for the manufacture of chemicals.

WEST VIRGINIA

The salt made in West Virginia is all obtained from natural brines. In 1930 the operators were as follows:

Kanawha County:
  Malden—J. Q. Dickinson & Co.; evaporated salt (open pans or grainers), also bromine and calcium chloride.
  South Charleston—Westvaco Chlorine Products (Inc.); brine used in the manufacture of chlorine, also bromine.

Mason County:
  Hartford—Liverpool Salt & Coal Co.; evaporated salt (open pans or grainers), also bromine and calcium chloride.
  Mason—Ohio River Salt Corporation; evaporated salt (open pans or grainers), also bromine and calcium chloride.

BROMINE

The figures for bromine production as given in this report comprise the quantity of bromine recovered by the producers from natural brines and the bromine content of bitterns used by producers in the manufacture of bromine compounds. The larger part of the bromine output as reported is not sold as bromine but as potassium and sodium bromide, as ethylene dibromide, and as other bromine compounds. In 1930 the bromine produced amounted to 8,462,800 pounds, valued at $2,109,974. This production is about 1⅓ times that in 1929, which was nearly three times that in 1928. The production of bromine in the United States was augmented greatly in 1924 by the demand for ethylene dibromide for use in the manufacture of high-powered gasoline. In 1925 and 1926 demand for bromine fell off on account of temporary restrictions placed upon the manufacture of such gasoline, but since that time the output of bromine has increased steadily. The decrease in unit value has been due in part to improvements in methods of manufacture. Imports of ethylene dibromide, all of which came from Germany, increased notably in 1930.

The plants operated in 1930 were those of the California Chemical Corporation (address, 111 Sutter Street, San Francisco), Chula Vista, Calif.; Ruggles & Rademaker Co., Manistee, Mich.; The Dow Chemical Co., Midland, Mich.; Pomeroy Salt Corporation (address, Pomeroy, Ohio), Minersville, Ohio; The Excelsior Salt Works, Pomeroy, Ohio; J. Q. Dickinson & Co., Malden, W. Va.; Liverpool Salt & Coal Co., Hartford, W. Va.; Ohio River Salt Corporation, Mason, W. Va.; and Westvaco Chlorine Products (Inc.), South Charleston, W. Va. So far as the Bureau of Mines is informed no bromine was produced directly from sea water in 1930.

Bromine and bromine in compounds sold or used by producers in the United States, 1921–1930

Year	Pounds	Value	Year	Pounds	Value
1921	711, 953	$172, 759	1926	1, 245, 760	$426, 837
1922	1, 005, 174	150, 668	1927	1, 756, 310	564, 689
1923	842, 352	146, 176	1928	2, 164, 000	649, 475
1924	2, 033, 804	594, 685	1929	6, 414, 620	1, 759, 325
1925	1, 566, 120	488, 406	1930	8, 462, 800	2, 109, 974

The figures for the value of bromine, as reported to the Bureau of Mines by the producers, represent the value of the bromine f. o. b. at plant or shipping point. The average unit value for 1930 was 25 cents a pound, compared with 27 cents in 1929, 30 cents in 1928, and 32 cents in 1927. The wholesale price per pound of bulk bromine in 1930 as quoted in the New York market was, according to Chemical and Metallurgical Engineering, 45 to 47 cents a pound. This has been the price since 1926.

The following table shows the imports of bromine and bromine compounds into the United States from 1926 to 1930.

Bromine and bromine compounds imported for consumption in the United States, 1926–1930

Product	1926		1927		1928		1929		1930	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
Bromine	37,839	$14,486					17,573	$5,804	1,123	$347
Ammonium bromide	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	7,717	[2] 2,209
Potassium bromide	70,440	18,549	20,813	$7,075	23,231	$7,918	28,310	9,834	64,399	16,439
Sodium bromide	212,365	73,313	1,102	370			110	51	20,774	4,991
Ethylene dibromide	271,645	102,894	465,048	144,167	283,205	86,966	443,004	104,917	3,023,484	648,455
Other bromine compounds					27,730	2,857	643	572	21,594	13,378

(1) Not separately recorded prior to tariff of June 18, 1930.

[2] June 18 to December 31. Not separately recorded prior to change in tariff.

TARIFF

Bromine and its compounds were on the free list until the tariff act of 1922, when a duty of 10 cents a pound was placed on bromine, potassium bromide, and all other bromine compounds not specially provided for. No change was made in this rate by the tariff act of 1930.

CALCIUM CHLORIDE

The calcium chloride reported in the following table is an original constituent of the natural brine produced in connection with the extraction of salt or salt and bromine from mineral raw materials only. A further large output of calcium chloride made by manufacturing processes used in chemical industries is not reported. The calcium chloride reported includes an output of mixed calcium and magnesium chlorides and other salts. The production of calcium chloride from natural brines has increased steadily for the past nine years, and the output of 116,160 short tons, valued at $2,207,800, in 1930 represents an increase of 2 per cent in quantity and 5 per cent in value over the output in 1929.

The calcium chloride reported here for 1930 was produced by the California Rock Salt Co. (address, 2465 Hunter Street, Los Angeles), Saltus, Calif.; Saline Products (Inc.) (address, 2000 Santa Fe Avenue, Los Angeles), Amboy, Calif.; The Dow Chemical Co., Midland, Mich.; Pomeroy Salt Corporation (address, Pomeroy, Ohio), Minersville, Ohio; The Excelsior Salt Works, Pomeroy, Ohio; J. Q. Dickinson & Co., Malden, W. Va.; Liverpool Salt & Coal Co., Hartford, W. Va.; and Ohio River Salt Corporation, Mason, W. Va.

Calcium (calcium-magnesium) chloride from natural brines sold by producers in the United States, 1921–1930

Year	Short tons	Value	Year	Short tons	Value
1921	23,672	$510,723	1926	82,340	$1,710,405
1922	33,067	571,326	1927	95,721	1,947,797
1923	44,961	663,384	1928	102,090	1,995,603
1924	58,791	1,164,848	1929	114,240	2,097,061
1925	67,870	1,386,639	1930	116,160	2,207,800

Imports of calcium chloride were not separately recorded by the Bureau of Foreign and Domestic Commerce prior to September 22, 1922. There is at present no duty on calcium chloride. The following table shows the available figures for imports.

Calcium chloride imported for consumption in the United States, September 22, 1922, to December 31, 1930

Year	Short tons	Value	Year	Short tons	Value
1922 (Sept. 22 to Dec. 31)	740	$8,563	1927	6,514	$85,456
1923	3,232	48,527	1928	9,263	100,223
1924	3,996	54,542	1929	8,236	113,573
1925	2,253	37,121	1930	6,641	95,921
1926	7,372	96,742			

Exports of calcium chloride were not separately recorded until 1929, when 15,425 short tons, valued at $362,658, was exported. Exports in 1930 amounted to 21,350 tons, valued at $513,577.

IODINE

Very little naturally occurring iodine has been produced in the United States. During the war a small quantity of iodine was produced from kelp at plants on the Pacific coast, but these are no longer in operation. During recent years extensive experimental work has been done on processes for the extraction of iodine from brines and oil-well waters. The iodine obtained has been sold commercially, but because the character of the industry is at present experimental and because there are only two producers the Bureau of Mines is not at liberty to publish figures of production. The General Salt Co., Long Beach, Calif., and The Dow Chemical Co., Midland, Mich., are the companies interested in this project.

The present supply of iodine in the United States is imported chiefly from Chile, where it is obtained as a by-product of the nitrate plants. Practically all of the iodine enters the United States in crude form, with occasional small shipments of resublimed material. The crude iodine enters free of duty. The resublimed product is subject to a duty of 10 cents a pound under the tariff act of 1930; prior to June, 1930, the duty was 20 cents a pound.

Iodine imported for consumption in the United States, 1921–1930

Year	Crude		Resublimed		Year	Crude		Resublimed	
	Pounds	Value	Pounds	Value		Pounds	Value	Pounds	Value
1921	644,711	$1,425,934	1,500	$4,730	1926	711,291	$2,272,343		
1922	352,557	1,024,609			1927	926,492	2,900,574		
1923	273,338	883,361	24	45	1928	720,766	2,429,076	3	$15
1924	(1)	(1)	(1)	(1)	1929	627,162	2,249,266		
1925	246,474	889,860	1	6	1930	493,587	1,797,754		

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[1] Figures for 1924 not recorded by Bureau of Foreign and Domestic Commerce.

GYPSUM[1]

By R. M. SANTMYERS and JEFFERSON MIDDLETON[2]

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INTRODUCTION

The general recession in the building-construction industry throughout the United States in 1930 was reflected in the total quantity of crude gypsum mined; production decreased 31 per cent from that in 1929 and 39 per cent from that in the peak year, 1925.

The quantity of gypsum used for alterations and repairs was somewhat above the average for recent years, but this increase failed by a wide margin to offset the slump in new construction, which fell far below the average for recent years. Gypsum used in the construction of new homes also dropped far below the average for recent years. In fact, public and industrial buildings represented the only type of new construction for which demand did not decline drastically.

Although the price trend during the past four years has been downward, there was a decided upward movement toward the latter part of 1930 among a few of the products in some sections of the country, notably in the East and on the Pacific coast. The average rise in price for calcined-gypsum products, based on the value of the total sales, was approximately 32 per cent over 1929 prices, although many individual producers reported the same prices as in 1929. Rises of 30 to 70 per cent were reported locally on fibered hard-wall plaster.[3]

PRODUCTION AND SALES

The quantity of crude gypsum mined in the United States in 1930 was 3,471,393 short tons, a decrease of 1,544,739 tons, or 31 per cent, as compared with 1929. The number of operators in 1930 was 56, a decrease of 3 from 1929. The value of the sales of uncalcined and calcined gypsum by producers was $27,051,484 in 1930, compared with $31,292,969 in 1929 and $32,036,163 in 1928—14 per cent less than in 1929 and 16 per cent less than in 1928. Of the total quantity mined in 1930, 989,591 tons was sold by producers without calcining (a decrease of 76,106 tons from 1929) and was valued at $1,886,254 ($1.91 per ton, or 6 cents less than in 1929). Sales of calcined gypsum by producers in 1930 amounted to 2,191,376 tons, valued at $25,165,230, or $11.48 per ton; this represents an increase of $2.79 per ton or 32 per cent in comparison with 1929.

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[1] Work on manuscript completed June, 1931.

[2] Figures on imports and exports (unless otherwise indicated) compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

[3] Rock Products, Gypsum Tonnage Reduced but Prices are Firm: Jan. 3, 1931, p. 122.

New York continued to be the largest producer of gypsum, but like most other States showed a decrease in 1930. There were 10 active operators (one less than in 1929); they produced 912,070 tons, a decrease of 372,268 tons or 29 per cent from the previous year. New York, as usual, was also the largest seller of gypsum in 1930. During the year there were marketed 275,294 tons of uncalcined gypsum, having a reported value of $597,938, and 573,602 tons of calcined gypsum, valued at $6,461,170. These tonnages represent decreases of 8 per cent in quantity sold without calcining and 33 per cent in quantity sold calcined as compared with 1929; the values represent decreases of 16 and 15 per cent, respectively. Other important States in the production of crude gypsum in 1930 were as follows: Michigan, 519,225 tons (898,547 tons in 1929); Iowa, 481,047 tons (718,503 tons in 1929); Texas, 359,315 tons (520,519 tons in 1929); and Ohio, 255,337 tons (374,008 tons in 1929). These five States reported 73 per cent of the total production in 1930.

Sales of crude gypsum by producers to cement mills in 1930 amounted to 933,381 tons, valued at $1,689,358, compared with 1,020,234 tons, valued at $1,914,263, in 1929—decreases of 9 and 12 per cent, respectively.

The quantity of crude gypsum sold by producers in 1930 as agricultural gypsum was 31,029 tons, valued at $158,538, compared with 38,099 tons, valued at $161,288, in 1929—decreases of 19 per cent in quantity and 2 per cent in value.

Gypsum mined and uncalcined and calcined gypsum sold by producers in the United States, 1921–1930

Year	Number of operators	Total quantity mined (short tons)	Sold without calcining		Sold calcined		Total value of sales
			Short tons	Value	Short tons	Value	
1921	62	2,890,784	642,944	$2,266,011	1,796,851	$21,434,279	$23,700,290
1922	64	3,779,949	770,725	2,443,346	2,491,265	26,917,805	29,361,151
1923	62	4,753,448	847,242	2,577,436	3,101,378	32,310,719	34,888,155
1924	72	5,042,629	982,108	2,674,320	3,568,569	40,050,187	42,724,507
1925	61	5,678,302	1,014,135	2,823,229	4,096,357	44,754,011	47,577,240
1926	59	5,635,441	961,363	2,509,885	4,015,974	44,211,334	46,721,219
1927	60	5,346,888	965,371	2,388,663	3,912,211	39,785,791	42,174,454
1928	58	5,102,250	999,412	1,902,034	3,641,385	30,134,129	32,036,163
1929	59	5,016,132	1,065,697	2,096,779	3,361,580	29,196,190	31,292,969
1930	56	3,471,393	989,591	1,886,254	2,191,376	25,165,230	27,051,484

The amount of calcined gypsum sold during 1930 for building purposes was 2,024,831 tons, valued at $23,923,370, or 92 per cent of the quantity and 95 per cent of the value of the total sales of calcined gypsum; the corresponding figures for 1929 were 3,125,066 tons, valued at $27,583,813, or 93 per cent of the total quantity and 94 per cent of the total value. Sales of fibered plaster in 1930 amounted to 964,347 tons, valued at $7,238,955, 48 per cent of the total quantity sold for building purposes but only 30 per cent of the total value of such sales. Sales of wall board in 1930 ranked second in quantity sold, amounting to 261,929 tons (316,591,528 square feet), valued at $7,833,860, or 13 per cent of the total quantity (in tons) sold for building and 33 per cent of the total value. The third largest item as regards quantity sold in 1930 was neat plaster, sales of which amounted to 225,877 tons, valued at $1,567,331, or 11 per cent of the total quantity sold for building and 7 per cent of the total value; these figures show decreases from those for 1929, when 300,459 tons, valued at $1,883,100, was reported as having been sold. Sales of Keenes cement during 1930 were 39,446 tons, valued at $571,044, compared with 52,330 tons, valued at $767,621, in 1929, decreases of 25 per cent in quantity and 26 per cent in value.

The amount of calcined gypsum sold during 1930 for manufacturing uses was 166,545 tons, valued at $1,241,860, or 8 per cent of the quantity and 5 per cent of the value of the total sales of calcined gypsum; these figures, however, represent decreases of 69,969 tons and $370,517 from the total sales of calcined gypsum for manufacturing purposes in 1929. The largest item in quantity under this heading was plaster of Paris (molding, casting, etc.), sales of which amounted to 93,718 tons, valued at $768,257, or 56 per cent of the total quantity sold for manufacturing uses and 62 per cent of the total value of such sales. The reported sales of calcined gypsum to plate-glass works in 1930 were 51,514 tons, valued at $304,981, decreases of 34,285 tons and $291,508 from the sales reported under this heading for 1929.

Gypsum sold by producers in the United States, 1928–1930, by uses

Use	1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value
Without calcining:						
To cement mills	969,357	$1,802,164	1,020,234	$1,914,263	933,381	$1,689,358
For agriculture	25,668	90,937	38,099	161,288	31,029	158,538
For other uses [1]	4,387	8,933	7,364	21,228	25,181	38,358
Total without calcining	999,412	1,902,034	1,065,697	2,096,779	989,591	1,886,254
Calcined:						
For building purposes—						
Neat plaster	551,674	3,284,293	300,459	1,883,100	225,877	1,567,331
Sanded plaster	245,617	1,314,480	129,026	752,528	104,448	681,265
Fibered plaster	1,549,483	7,677,864	1,597,846	7,814,603	964,347	7,238,955
Plaster board and lath	[2] 252,813	4,107,848	[3] 236,761	3,591,880	[4] 217,580	4,260,087
Wall board	[5] 459,177	9,046,926	[6] 524,307	10,538,811	[7] 261,929	7,833,860
Partition tile	218,560	1,675,153	221,899	1,440,538	158,440	1,020,922
Special tile and block	5,856	70,222	7,445	98,856	(8)	(8)
For insulating	12,776	226,605	10,307	186,830	7,861	149,874
Keenes cement	54,020	848,504	52,330	767,621	39,446	571,044
Other building purposes [9]	97,520	731,669	44,686	509,046	[8] 44,903	[8] 600,032
Total for building purposes	3,447,496	28,983,564	3,125,066	27,583,813	2,024,831	23,923,370
For manufacturing uses—						
Plaster of Paris (molding and casting, pottery, foundry, terra cotta, and architectural plaster)	67,067	500,582	102,801	827,413	93,718	768,257
To plate-glass works	105,275	544,158	85,799	596,489	51,514	304,981
For other manufacturing uses [10]	21,547	105,825	47,914	188,475	21,313	168,622
Total for manufacturing uses	193,889	1,150,565	236,514	1,612,377	166,545	1,241,860
Total calcined	3,641,385	30,134,129	3,361,580	29,196,190	2,191,376	25,165,230
Grand total value	----------	32,036,163	----------	31,292,969	----------	27,051,484

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[1] 1928: Includes gypsum sold for soil corrective, poultry grits, and road work and to paint mills. 1929: Includes gypsum sold for insulating material, to paint mills, and as rock dust. 1930: Includes gypsum sold to plaster mills, to plate-glass works, for insulating material, and as rock dust.

[2] 284,440,741 square feet.

[3] 267,215,128 square feet.

[4] 258,809,622 square feet.

[5] 559,936,675 square feet.

[6] 618,829,362 square feet.

[7] 316,591,528 square feet.

[8] Gypsum sold for special tile and block in 1930 included under "Other building purposes."

[9] 1928: Includes finished plaster, prepared finishes, board filler, roofing tile, etc. 1929: Includes finished plaster, prepared finishes, joint filler, roofing tile, sheet-rock finisher, etc. 1930: Includes embello, finished plaster, prepared finishes, joint filler, roofing tile, stucco for roof construction, sheet-rock finisher, tile cement, etc.

[10] 1928: Includes dental plaster, etc. 1929: Includes stucco for plaster and wall board and for filler. 1930: Includes stucco for plaster and wall board and for filler and hydrocal.

Keenes cement sold by producers in the United States, 1921–1930

Year	Manufacturers	Short tons	Value	Year	Manufacturers	Short tons	Value
1921	7	14,430	$232,457	1926	4	42,436	$603,781
1922	6	21,991	324,316	1927	4	41,431	674,698
1923	5	23,273	323,127	1928	6	54,020	848,504
1924	6	30,620	428,684	1929	6	52,330	767,621
1925	5	36,607	503,397	1930	4	39,446	571,044

Gypsum mined and uncalcined and calcined gypsum sold by producers in the United States, 1929 and 1930, by States

State	Number of operators	Total quantity mined (short tons)	Sold without calcining		Sold calcined		Total value of sales
			Short tons	Value	Short tons	Value	
1929							
Iowa	8	718,503	148,442	$238,734	521,761	$4,430,122	$4,668,856
Michigan	5	898,547	213,657	299,249	481,872	4,016,085	4,315,334
Nevada	5	225,514	43,815	131,735	148,640	1,159,119	1,290,854
New York	11	1,284,338	298,793	707,644	859,147	7,632,208	8,339,852
Ohio	3	374,008	12,190	30,696	356,734	3,270,744	3,301,440
Oklahoma	3	369,433	(1)	(1)	(1)	(1)	2,255,374
Texas	4	520,519	29,991	47,836	416,276	3,392,451	3,440,287
Other States [2]	20	625,270	[3] 318,809	[3] 640,885	[3] 577,150	[3] 5,295,461	3,680,972
	59	5,016,132	1,065,697	2,096,779	3,361,580	29,196,190	31,292,969
1930							
Iowa	7	481,047	155,762	215,702	303,230	3,525,617	3,741,319
Michigan	5	519,225	182,050	292,881	300,524	3,462,750	3,755,631
Nevada	5	165,279	49,801	137,214	97,530	839,436	976,650
New York	10	912,070	275,294	597,938	573,602	6,461,170	7,059,108
Ohio	3	255,337	11,460	30,017	243,566	3,064,478	3,094,495
Texas	5	359,315	54,146	84,883	255,727	3,436,860	3,521,743
Utah	3	26,694	(1)	(1)	(1)	(1)	185,148
Other States [2]	18	752,426	[3] 261,078	[3] 527,619	[3] 417,197	[3] 4,374,919	4,717,390
	56	3,471,393	989,591	1,886,254	2,191,376	25,165,230	27,051,484

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(1) Included under "Other States."

[2] 1929: Arizona, California, Colorado, Kansas, Montana, New Mexico, South Dakota, Utah, Virginia, and Wyoming. 1930: Arizona, California, Colorado, Kansas, Montana, Oklahoma, South Dakota, Virginia, and Wyoming.

[3] This figure includes also sales from States entered as "(1)" above.

KETTLES AND KILNS IN OPERATION

The following table gives a comparison of the number and distribution of kettles and kilns (rotary and vertical) in operation in 1929 and 1930.

The number of producers reporting dropped from 50 in 1929 to 46 in 1930, with a decrease in the number of kettles in operation from 191 to 181. The number of rotary and vertical kilns, however, increased from 14 in 1929 to 26 in 1930, and the total daily capacity of the kilns increased from 4,700 to 8,283 tons. The total daily capacity, based on a 24-hour operating schedule, of both kettles and kilns increased from 27,390 tons in 1929 to 30,371 tons in 1930.

Calcining kettles and kilns reported by gypsum producers in the United States, 1929 and 1930, by States

State	Number of producers	Kettles		Rotary kilns[1]		Total daily capacity (short tons)
		Number	Daily capacity (short tons)	Number	Daily capacity (short tons)	
1929						
California	3	8	850	----------	----------	850
Iowa	6	27	4,444	----------	----------	4,444
Michigan	5	31	3,696	----------	----------	3,696
Nevada	3	13	1,500	----------	----------	1,500
New York	7	21	2,890	10	3,680	6,570
Ohio	3	11	2,410	----------	----------	2,410
Texas	4	23	1,978	----------	----------	1,978
Other States[2]	19	[3]57	4,922	[3]4	1,020	5,942
	50	[3]191	22,690	[3]14	4,700	27,390
1930						
California	3	8	790	----------	----------	790
Iowa	5	27	4,744	----------	----------	4,744
Michigan	5	31	3,626	(4)	(4)	[5]3,626
Nevada	3	13	1,380	----------	----------	1,380
New York	6	23	3,190	16	[6]5,508	8,698
Ohio	3	11	2,170	(4)	(4)	[5]2,170
Texas	4	23	2,008	----------	----------	2,008
Utah	3	5	260	----------	----------	260
Other States[2]	14	40	3,920	[7]10	[7]2,775	[7]6,695
	46	181	22,088	26	8,283	30,371

[1] Includes in 1930 a few vertical kilns reported by one operator each in New York and Utah.

[2] 1929: Arizona, Colorado, Indiana (crude gypsum from Michigan), Kansas, Montana, New Mexico, Oklahoma, South Dakota, Utah, Virginia, and Wyoming. 1930: Arizona, Colorado, Indiana (crude gypsum from Michigan), Kansas, Montana, Oklahoma, South Dakota, Virginia, and Wyoming.

[3] Revised figures.

[4] Included under "Other States."

[5] Capacity of kettles only; capacity of rotary kilns included under "Other States."

[6] Estimated.

[7] This figure covers also certain items for States as indicated by "[4]" and "[5]" above.

PRICES AND MARKET

According to figures published in Rock Products the prices of gypsum products in 1930 showed but slight change from those prevailing in 1929. On the Pacific coast, in spite of a shrinkage of 10 to 20 per cent in building activities, the industry enjoyed an upward movement in prices toward the end of the year. The situation after this revision has been described as follows:[4]

> Beginning in November, the Pacific coast plants were put on a $10 per ton, mill basis, for hardwall plaster in paper sacks. This has made an increase in price at Los Angeles of approximately $4 per ton. The price basis now is $10 in paper sacks at Midland and Plaster City, plus $2.20 freight. The price at Gerlach and Ludwig, Nev., is $10, f. o. b. plant, in paper sacks, with a freight rate to San Francisco of $3.90, making the net price to dealers there $13.90. In the Northwest the price at Hanover and Crystal, Mont., is $10 at the mill, with a freight rate to Seattle of $5 per ton, making a net dealer's price there of $15 per ton.

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[4] Rock Products, Work cited, p. 122.

Gypsum prices, per short ton in carload lots, f.o.b. mill, in 1930[1]

District	Crushed rock			Ground gypsum			Agricultural gypsum			Stucco, calcined			Keenes cement		
	Mar. 1	July 5	Dec. 6	Mar. 1	July 5	Dec. 6	Mar. 1	July 5	Dec. 6	Mar. 1	July 5	Dec. 6	Mar. 1	July 5	Dec. 6
Acme, Tex.	$1.50-3.00	$1.50-3.00	------	$4.00	$4.00	------	$4.00	$4.00	------	$4.00-6.00	$4.00-6.00	------	$19.00	$19.00	------
Blue Rapids, Kans.	1.50-3.00	1.50-3.00	------	4.00	4.00	------	4.00	4.00	------	4.00-6.00	4.00-6.00	------	19.00	19.00	------
Centerville, Iowa	------	------	------	------	------	------	6.00	6.00	------	7.00	7.00	------	------	------	------
Fort Dodge, Iowa	2.50	2.50	------	6.00	6.00	------	6.00	6.00	------	7.00	7.00	------	16.00	16.00	------
Grand Rapids, Mich.	------	------	------	------	------	------	------	7.00	------	------	9.00	$9.00	------	26.00	------
Los Angeles, Calif.	------	------	------	7.00-9.00	7.00-9.00	$7.50	7.00-9.00	7.00-9.00	$7.50	7.50-9.00	7.50-9.00	10.00	30.00-40.00	30.00-40.00	------
Medicine Lodge, Kans.	1.40	1.40	$1.45	------	------	------	------	------	------	------	------	------	16.00	16.00	$16.00
Portland, Colo.	------	------	------	7.00	7.00	------	------	7.00	------	9.00	9.00	------	27.50	27.50	------
Seattle, Wash.	6.00	6.00	------	9.00	9.00	------	9.00	9.00	------	13.00	13.00	------	------	------	------
Winnipeg, Manitoba	5.00	5.00	5.00	5.00	5.00	5.00	7.00	7.00	7.00	13.00	13.00	13.00	------	------	------

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[1] Rock Products.

IMPORTS

The imports of crude gypsum for consumption in the United States amounted to 902,358 short tons in 1930, valued at $916,663, the first decrease recorded since that in 1921. In 1930 Canada was, as usual, the chief foreign source of supply, furnishing 824,964 tons, valued at $837,296, or 91 per cent of both the total quantity and value imported; Mexico furnished the remainder.

The gypsum rock imported from Canada is destined mainly for manufacture at plants along the Atlantic seaboard, although Canadian gypsum (and anhydrite) is imported in some quantity at Norfolk for use as a fertilizer in the growing of peanuts. The Mexican rock from Lower California goes to Long Beach, Calif., and Seattle, Wash.

Imports of ground or calcined gypsum increased from 4,979 short tons, valued at $69,703, in 1929 to 6,562 tons, valued at $75,959, in 1930 (32 and 9 per cent, respectively). The value of the imports of manufactured plaster of Paris decreased from $71,479 in 1929 to $61,322 in 1930, or 14 per cent. Imports of Keenes cement, however, increased enormously, amounting to 1,146 tons, valued at $37,175, in 1930, compared with 430 tons, valued at $11,327, in 1929.

The total value of the imports of gypsum and gypsum products was thus $1,091,119 in 1930, compared with $1,213,383 in 1929 (a decrease of 10 per cent) and with $1,541,796 in 1928 (a decrease of 29 per cent).

Figures on imports of gypsum, as recorded by the Bureau of Foreign and Domestic Commerce, are given in the two tables following.

Gypum imported for consumption in the United States, 1921–1930

Year	Crude		Ground or calcined		Manufactured plaster of Paris (value)	Keenes cement		Total value
	Short tons	Value	Short tons	Value		Short tons	Value	
1921	266,796	$364,318	4,495	$55,109	$33,072	184	$6,836	$459,335
1922	409,475	523,939	1,774	32,651	55,116	403	9,636	621,342
1923	448,129	629,203	5,133	77,716	41,317	418	11,543	759,779
1924	519,627	724,864	5,217	70,793	48,059	539	12,042	855,758
1925	634,423	915,888	10,759	140,941	56,724	449	11,294	1,124,847
1926	824,081	1,276,131	7,149	99,058	96,355	578	15,701	1,487,245
1927	828,619	1,167,581	8,650	114,947	89,096	655	16,202	1,387,826
1928	1,028,816	1,340,920	6,907	99,833	87,314	601	13,729	1,541,796
1929	1,036,385	1,060,874	4,979	69,703	71,479	430	11,327	1,213,383
1930	902,358	916,663	6,562	75,959	61,322	1,146	37,175	1,091,119

Crude gypsum imported into the United States, 1928–1930, by countries

[General imports]

Country	1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value
Algeria and Tunisia	----------	----------	1	$55	----------	----------
Canada	933,478	$1,242,781	947,331	976,455	824,964	$837,296
China	2	9	----------	----------	----------	----------
Cuba	----------	----------	(1)	5	----------	----------
Germany	2,951	4,659	----------	----------	----------	----------
Hong Kong	6	104	3	80	----------	----------
Mexico	92,363	92,563	89,041	84,240	77,394	79,367
United Kingdom	16	804	9	39	----------	----------
	1,028,816	1,340,920	1,036,385	1,060,874	902,358	916,663

[1] Less than ½ ton.

Eight importers with 13 plants in 10 States—California, Connecticut, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Vermont, Virginia, and Washington—reported to the Bureau of Mines that they imported 794,970 short tons of crude gypsum in 1930, compared with 1,017,791 tons in 1929, a decrease of 22 per cent. Resales of crude foreign gypsum, as reported by these importers for 1930, were 93,515 tons, valued at $391,150, an increase of 12 per cent in quantity and 18 per cent in value compared with 1929. Sales of calcined gypsum made from imported material, as reported by these importers for 1930, amounted to 648,162 tons, valued at $8,211,837, a decrease of 21 per cent in quantity but an increase of 5 per cent in value.

The first of the two following tables shows the crude gypsum imported and the uncalcined and calcined gypsum made therefrom and sold in the United States from 1925 to 1930; the second table shows the foreign gypsum sold in the United States from 1928 to 1930, by uses.

Crude gypsum imported and uncalcined and calcined gypsum, from imported rock, sold in the United States, 1925–1930, as reported to the Bureau of Mines by the importers

Year	Number of importers	Total quantity of crude imported (short tons)	Sold without calcining		Sold calcined		Total value of sales
			Short tons	Value	Short tons	Value	
1925	7	609,419	23,299	$205,375	498,103	$5,645,597	$5,850,972
1926	8	807,771	60,374	325,466	586,878	6,341,022	6,666,488
1927	8	785,476	107,307	457,747	585,880	6,431,843	6,889,590
1928	8	954,030	121,339	449,246	805,920	7,657,460	8,106,706
1929	8	1,017,791	83,681	331,979	820,737	7,842,523	8,174,502
1930	8	794,970	93,515	391,150	648,162	8,211,837	8,602,987

Foreign gypsum sold in the United States, 1928–1930, by uses, as reported to the Bureau of Mines by the importers

Use	1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value
Without calcining:						
To cement mills	86,661	$268,040	55,418	$168,225	66,072	$236,293
For agriculture For other uses	34,678	181,206	28,263	163,754	27,443	154,857
Total without calcining	121,339	449,246	83,681	331,979	93,515	391,150
Calcined:						
For building purposes—						
Neat plaster	132,559	1,622,116	195,486	2,210,338	142,055	1,578,124
Sanded plaster	83,302	540,324	67,468	397,404	47,197	326,421
Fibered plaster	389,829	2,610,328	380,569	2,424,971	294,551	2,488,260
Plaster board	49,740	632,489	62,609	829,153	(1)	(1)
Wall board	65,124	1,171,613	87,316	1,651,032	(1)	(1)
Partition tile	15,993	127,557	[3] 8,270	[3] 133,061	15,363	117,618
Other building purposes[2]	14,435	189,869			[1,3] 117,876	[1,3] 3,306,746
For manufacturing uses—						
Plaster of Paris	51,372	731,718	19,019	196,564	31,120	394,668
For other manufacturing uses[4]	3,566	31,446	(3)	(3)	(3)	(3)
Total calcined	805,920	7,657,460	820,737	7,842,523	648,162	8,211,837
Grand total value		8,106,706		8,174,502		8,602,987

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[1] Gypsum sold for plaster board and wall board in 1930 included under "Other building purposes."

[2] 1928: Includes acoustical and finishing plasters. 1929 and 1930: Includes gypsum for insulating use and acoustical plaster.

[3] Gypsum sold for "Other manufacturing uses" in 1929 and 1930 included under gypsum sold for "Other building purposes"; Bureau of Mines not at liberty to publish figures.

[4] 1928: Includes filler, dental plaster, etc., and gypsum sold to plate-glass works. 1929: Includes gypsum sold to plate-glass works and for patching plaster. 1930: Includes gypsum sold for patching plaster.

EXPORTS

Although exports of gypsum and gypsum products, as classified by the Bureau of Foreign and Domestic Commerce, were less in 1930 than in 1929, they were substantially larger than in 1928 and in other preceding years.

Gypsum and gypsum products exported from the United States, 1922–1930 [1]

Year	Short tons	Value	Year	Short tons	Value
1922	7,673	$178,166	1927 [2]	18,429	$471,106
1923	8,815	226,423	1928 [2]	18,788	416,748
1924	10,623	358,425	1929 [2]	28,809	512,186
1925	16,798	498,616	1930 [2]	23,611	420,728
1926	19,610	576,585			

[1] Exports of gypsum not separately classified prior to 1922. For 1927 and earlier years the classification reads "Gypsum or plaster, crude, ground, calcined, and manufactures of." For 1928, 1929, and 1930 exports are recorded as follows: "Crude, crushed, or ground," 2,365 short tons, valued at $23,764, in 1928; 4,230 tons, $30,870, in 1929; and 3,603 tons, $22,918, in 1930; and "Plaster, calcined, and manufactures, n. e. s.," 16,423 tons, $392,984, in 1928; 24,579 tons, $481,316, in 1929; and 20,008 tons, $397,810, in 1930.

[2] Exports of wall board were as follows: 9,531,453 square feet, valued at $243,578, in 1927; 15,216,727 square feet, $403,227, in 1928; 18,420,455 square feet, $442,983, in 1929; and 16,677,518 square feet, $431,072, in 1930. Figures for earlier years are not separately recorded.

REVIEW OF GYPSUM INDUSTRY

Few major developments in the gypsum industry characterized 1930. There appears, however, to be a growing tendency for gypsum companies to undertake the manufacture of allied products, such as metal lath and tile, lime, composition board, and other products used in connection with gypsum plaster.

No new plants were built by primary producers of gypsum. Moreover, the United States Gypsum Co. closed and dismantled its plant at Arden, Nev.; henceforth it will supply the southern and central California markets from its plant at Midland, Calif.

The Certain-teed Products Corporation closed its plant at Acme, N. Mex., during the year. Markets formerly served by this plant are now being supplied from the company's plant at Acme, Tex.

The Gulf Gypsum Co., near Falfurrias, Tex., a new producer, started operations in 1929 and during 1930 shipped crude gypsum to cement plants in the vicinity.

The Tidewater Gypsum Co., Houston, Tex., leased its salt and gypsum deposits on Hockley Dome to the Houston Salt Co. It is proposed to ship the gypsum to near-by cement plants. Eventually a calcining plant and board mill may be built near the mine.

WORLD PRODUCTION

The following table shows the output of gypsum by various countries from 1926 to 1930, as far as statistics are available:

World production of gypsum, 1926–1930, by countries, in metric tons

[Compiled by M. T. Latus, of the Bureau of Mines]

Country[1]	1926	1927	1928	1929	1930
Algeria	74,070	74,512	79,874	107,221	(2)
Argentina[3]	36,121	52,111	41,606	36,630	49,458
Australia:					
New South Wales	830	1,506	12,761	10,585	2,914
South Australia	66,666	95,356	93,004	98,468	(2)
Victoria	10,381	21,169	10,728	13,407	(2)
Western Australia	3,981	6,782	4,282	5,374	1,606
Austria[4]	58,000	40,000	45,000	43,000	37,350
Canada	844,760	1,003,073	1,189,895	(5)	(5)
Chile	6,991	8,245	9,113	(6)	(2)
China	[7] 50,000	45,220	[7] 50,000	[7] 50,000	[7] 50,000
Cuba	(2)	(2)	23,950	25,400	27,200
Cyprus[8]	20,737	15,393	11,609	12,757	10,452
Egypt[7]	130,000	130,000	130,000	130,000	130,000
Estonia	4,828	12,172	7,982	8,093	1,963
France	2,177,957	2,073,000	2,202,730	2,558,050	(2)
Germany:					
Bavaria	45,690	59,772	54,482	60,192	41,773
Prussia	262	538	452	402	292
Greece	9,723	2,014	----------	----------	(2)
India, British	35,026	38,717	59,998	53,572	(2)
Italy	655,548	673,931	640,587	683,755	685,530
Japan	264,989	75,498	68,515	(6)	(2)
Latvia[9]	21,616	24,463	28,020	26,875	35,272
Luxemburg	33,984	7,848	2,506	7,206	10,619
New Caledonia	20,000	10,000	15,000	7,116	3,131
Palestine	----------	1,158	1,341	1,499	1,661
Peru	16,004	13,225	20,148	[10] 15,299	[10] 14,000
Philippine Islands	387	----------	----------	----------	(2)
Poland	17,676	(2)	(2)	(2)	40,000
Rumania	44,316	77,724	47,785	76,625	(2)
Russia[11]	308,162	283,002	411,365	(6)	(2)
Spain	731,369	911,346	1,054,018	975,662	(2)
Sweden	137	89	116	(2)	(2)
Tunisia	13,070	16,000	16,000	19,540	(2)
Union of South Africa	11,389	15,430	14,871	17,245	(2)
United Kingdom:					
Great Britain	472,567	514,364	644,831	981,566	851,468
Northern Ireland	90	113	17	1,453	(2)
United States	5,112,359	4,850,590	4,628,659	4,550,535	3,149,178
Yugoslavia[12]	620	1,063	1,170	2,340	1,463
	11,300,000	11,200,000	11,600,000	12,100,000	(2)

[1] Gypsum is also produced in Switzerland where large beds are privately worked, but no statistics are available.

[2] Data not available.

[3] Rail and river shipments.

[4] Estimate furnished by Bundesministerium für Handel und Verkehr.

[5] Data for crude gypsum mined not available; estimate included in world total. Shipments of crude (lump, crushed, and ground) and calcined gypsum were as follows: 1929, 1,099,220 metric tons; 1930, 944,268 metric tons.

[6] Data not available; estimate included in world total.

[7] Approximate production.

[8] Exports of crude and calcined gypsum.

[9] Exports.

[10] Sales and shipments.

[11] Year ended Sept. 30.

[12] Serbia only.

CANADA

PRODUCTION

Despite a decrease of 14 per cent in quantity and 17 per cent in value of shipments during 1930, compared with the previous year, the gypsum industry in Canada did not suffer as much as that in the United States.

Production (shipments) of gypsum in Canada in 1930 amounted to 1,040,883 short tons, valued at $2,772,584, as follows: Lump or run-of-mine, 56,694 tons, valued at $122,963; crushed, 831,490 tons, valued at $991,148; fine ground, 2,276 tons, valued at $18,355; and calcined, 150,423 tons, valued at $1,640,118.

The following tables set forth these figures in comparison with those for previous years:

Gypsum trade in Canada, 1928–1930 [1]

	1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value
Production (shipments):						
By classes—						
Crude—						
Lump or run-of-mine	43,224	$80,467	44,848	$90,071	56,694	$122,963
Crushed	1,018,172	1,770,077	964,875	1,147,289	831,490	991,148
Fine ground	9,576	55,170	2,201	17,271	2,276	18,355
Calcined	175,396	1,837,934	199,765	2,091,065	150,423	1,640,118
	1,246,368	3,743,648	1,211,689	3,345,696	1,040,883	2,772,584
By Provinces—						
Nova Scotia	1,013,257	1,850,243	948,895	1,152,160	807,423	949,224
New Brunswick	75,033	501,252	70,482	485,982	71,813	437,112
Ontario	85,811	553,271	100,347	832,689	94,946	776,069
Manitoba	51,285	609,039	67,269	631,051	34,572	361,977
British Columbia	20,982	229,843	24,696	243,814	32,129	248,202
	1,246,368	3,743,648	1,211,689	3,345,696	1,040,883	2,772,584
Imports:						
Crude gypsum	1,097	40,312	1,244	18,671	898	25,882
Ground, not calcined	256	7,379	165	5,283	219	5,352
Calcined	10,563	142,550	16,356	189,438	16,608	190,832
	11,916	190,241	17,765	213,392	17,725	222,066
Exports:						
Crude gypsum	824,536	1,240,987	893,445	1,086,939	719,381	871,567
Plaster of Paris, prepared wall plaster	8,232	140,946	7,938	137,046	7,281	119,092
	832,768	1,381,933	901,383	1,223,985	726,662	990,659

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[1] Preliminary Report on the Mineral Production of Canada, Ottawa.

Crude (lump, crushed, and ground) and calcined gypsum shipped in Canada, 1921–1930, by classes [1]

Year	Crude					
	Lump and crushed			Ground		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
1921	262,349	$518,747	$1.98	7,020	$24,029	$3.42
1922	418,831	688,357	1.64	5,769	35,880	6.22
1923	450,313	837,648	1.86	7,452	45,719	6.14
1924	520,880	946,976	1.82	5,478	31,882	5.82
1925	579,378	1,018,947	1.76	5,993	35,843	5.98
1926	728,395	1,228,428	1.69	5,874	36,813	6.27
1927	890,763	1,594,558	1.79	7,065	42,633	6.03
1928	1,061,396	1,850,544	1.74	9,576	55,170	5.76
1929	1,009,723	1,237,360	1.23	2,201	17,271	7.85
1930	888,184	1,114,111	1.25	2,276	18,355	8.06

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[1] Preliminary Report on the Mineral Production of Canada, Ottawa.

Crude (lump, crushed, and ground) and calcined gypsum shipped in Canada, 1921–1930, by classes—Continued

Year	Calcined			Total		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
1921	117,181	$1,242,762	$10.61	386,550	$1,785,538	$4.62
1922	134,665	1,436,661	10.67	559,265	2,160,898	3.86
1923	120,536	1,359,733	11.28	578,301	2,243,100	3.88
1924	119,658	1,229,250	10.27	646,016	2,208,108	3.42
1925	154,952	1,335,101	8.62	740,323	2,389,891	3.23
1926	149,459	1,505,572	10.07	883,728	2,770,813	3.14
1927	165,289	1,613,824	9.76	1,063,117	3,251,015	3.06
1928	175,396	1,837,934	10.48	1,246,368	3,743,648	3.00
1929	199,765	2,091,065	10.47	1,211,689	3,345,696	2.76
1930	150,423	1,640,118	10.90	1,040,883	2,772,584	2.66

Gypsum shipped in Canada, 1921–1930, by Provinces [1]

Year	Nova Scotia		New Brunswick		Ontario	
	Short tons	Value	Short tons	Value	Short tons	Value
1921	206,831	$511,883	54,030	$360,220	84,790	$433,053
1922	332,404	580,148	82,462	517,668	110,227	621,668
1923	341,705	747,934	104,740	564,680	99,958	542,317
1924	441,752	915,845	86,738	476,804	88,121	467,097
1925	551,230	1,070,408	71,745	408,917	82,020	491,833
1926	678,107	1,187,918	59,546	468,411	89,987	496,059
1927	829,438	1,512,015	85,293	524,550	83,998	500,688
1928	1,013,257	1,850,243	75,033	501,252	85,811	553,271
1929	948,895	1,152,160	70,482	485,982	100,347	832,689
1930	807,423	949,224	71,813	437,112	94,946	776,069

Year	Manitoba		British Columbia		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1921	40,859	$480,282	40	$100	386,550	$1,785,538
1922	34,072	440,914	100	500	559,265	2,160,898
1923	31,575	386,554	323	1,615	578,301	2,243,100
1924	29,375	348,212	30	150	646,016	2,208,108
1925	35,088	417,868	240	865	740,323	2,389,891
1926	35,172	461,461	20,916	156,964	883,728	2,770,813
1927	39,895	512,008	24,493	201,754	1,063,117	3,251,015
1928	51,285	609,039	20,982	229,843	1,246,368	3,743,648
1929	67,269	631,051	24,696	243,814	1,211,689	3,345,696
1930	34,572	361,977	32,129	248,202	1,040,883	2,772,584

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[1] Preliminary Report on the Mineral Production of Canada, Ottawa.

In 1930 Nova Scotia accounted, as usual, for the larger part of the Canadian output, shipping 807,423 short tons, valued at $949,224. Most of the crude rock produced in Nova Scotia is destined for further fabrication in the United States, and the values are those of the shipping companies involved. Although the quantity shipped from this Province represents 78 per cent of the total for the Dominion during 1930, the value represents only 34 per cent of the total.

Ontario is the second largest producer of gypsum in Canada, its shipments during 1930 amounting to 94,946 tons, valued at $776,069. Practically all of this gypsum was consumed in Canada; none of the crude rock is shipped to the United States. Ontario produced 9 per cent of the total quantity and 28 per cent of the total value of the shipments of gypsum in Canada in 1930.

The third largest producer is New Brunswick, which shipped 71,813 tons, valued at $437,112, in 1930, or 7 per cent of the total quantity and 16 per cent of the total value.

Whereas production in other Provinces was fairly well maintained, the output in 1930 in Manitoba was little more than half that in 1929. This Province produced 34,572 tons, valued at $361,977, in 1930, compared with 67,269 tons, valued at $631,051, in 1929; its share in the Canadian totals declined in 1930 to only 3 per cent of the quantity and 13 per cent of the value.

On the other hand, British Columbia increased its shipments from 24,696 tons, valued at $243,814, in 1929 to 32,129 tons, valued at $248,202, in 1930. The figures for 1930 represent 3 per cent of the quantity and 9 per cent of the value of the total shipments of Canadian gypsum.

EXPORTS AND IMPORTS

In 1930 Canada exported 719,381 short tons of gypsum, valued at $871,567, or 69 per cent of the total quantity produced and 31 per cent of its value and decreases of 174,064 tons and $215,372 as compared with exports in 1929. Virtually all of the gypsum exported came from Nova Scotia.

The following tables show the foreign trade of Canada in crude gypsum and calcined gypsum products:

Crude gypsum exported from Canada, 1921–1930 [1]

Year	Short tons	Value	Per cent of total quantity shipped	Year	Short tons	Value	Per cent of total quantity shipped
1921	230,011	$417,502	60	1926	668,064	$1,069,123	76
1922	325,354	505,464	58	1927	588,808	959,858	55
1923	397,329	578,859	69	1928	824,536	1,240,987	66
1924	472,236	747,829	73	1929	893,445	1,086,939	74
1925	533,646	861,468	72	1930	719,381	871,567	69

[1] Preliminary Report on the Mineral Production of Canada, Ottawa.

Gypsum imported into Canada, 1921–1930 [1]

Year	Crude gypsum		Ground gypsum		Plaster of Paris	
	Short tons	Value	Short tons	Value	Short tons	Value
1921	2,952	$31,303	41	$2,427	2,635	$42,325
1922	2,872	21,040	148	5,592	3,657	49,015
1923	3,654	39,336	78	3,253	3,617	54,591
1924	3,252	63,156	102	2,174	3,969	62,770
1925	4,433	66,064	119	3,858	4,369	66,386
1926	933	32,442	209	6,846	5,156	79,853
1927	1,092	42,741	111	2,996	7,016	101,823
1928	1,097	40,312	256	7,379	10,563	142,550
1929	1,244	18,671	165	5,283	16,356	189,438
1930	898	25,882	219	5,352	16,608	190,832

[1] Preliminary Report on the Mineral Production of Canada, Ottawa.

NOTES ON CANADIAN INDUSTRY

Several changes took place in the industry in Canada during 1930. The Canadian Gypsum Co., a subsidiary of the United States Gypsum Co., acquired the holdings of the Albert Manfacturing Co., with deposits and plants at Hillsborough, New Brunswick. The latter company, one of the oldest in Canada, dates back prior to 1847, when shipments were first made by water during the summer to plants along the coast of Maine. The Canadian Gypsum Co. now supplies Canadian requirements and ships plasters to several foreign countries. During the year the company calcined more than half of its output of 80,000 tons of gypsum rock for making finishing plasters and hard-wall plaster, all but 3,000 tons (shipped to New Zealand) being for the Canadian trade.

One new project, including calcining and wall-board plants, was carried out in Canada during the year—the Western Gypsum Products (Ltd.) completed a 2-kettle calcining plant near Winnipeg, Manitoba, and a plant capable of producing 80,000 feet of wall board per day. A tile plant is also provided for.[5] The company obtains its supplies of crude gypsum from Amaranth, on the southwestern end of Lake Manitoba, in the same Province.

The Gypsum, Lime & Alabastine, Canada (Ltd.) carried out numerous improvements at the calcining, wall-board, and tile plants and the quarry at its Westminster mill. The plants are 280 miles from the company's deposits at Falkland, B. C.

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[5] Rock Products, Work cited, p. 123.

GRAPHITE [1]

By Jefferson Middleton

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INTRODUCTION

This chapter presents statistics relating to graphite in 1930 and recent preceding years, together with brief text on the subject.

The values given for domestic graphite are f. o. b. plants; those for imports, at the principal markets of the countries from which the graphite was exported; and those for exports, at the port of shipment.

The graphite industry in the United States suffered a severe recession in 1930. Sales of amorphous graphite decreased 45 per cent in quantity and 56 per cent in value as compared with 1929; in comparison with sales in 1920, those in 1930 represent a decrease of 59 per cent in both quantity and value. Sales of crystalline graphite decreased in even greater proportion; as only two operators reported sales of crystalline graphite in 1930 the Bureau of Mines is not at liberty to give definite figures for sales. Imports of graphite also decreased greatly in 1930 as compared with 1929.

Economic difficulties in the graphite industry were not confined to the United States. Most of the large producing countries throughout the world for which figures on output in 1930 are available show decreases as compared with 1929. The industry in Ceylon particularly seems to have suffered severely. The generally depressed state of the graphite industry in 1930 is partly explained by the prevailing world-wide business slump. The decreased activity may be due partly also to lessened demand for graphite because of changes affecting its use; the only remedy for this situation is the finding of new uses for graphite.

The tariff act of 1930, which became effective June 18, contained the following paragraph concerning graphite:

> Par. 213. Graphite or plumbago, crude or refined: Amorphous, 10 per centum ad valorem; crystalline lump, chip, or dust, 30 per centum ad valorem; crystalline flake, 1 65/100 cents per pound. As used in this paragraph, the term "crystalline flake" means graphite or plumbago which occurs disseminated as a relatively thin flake throughout its containing rock, decomposed or not, and which may be or has been separated therefrom by ordinary crushing, pulverizing, screening, or mechanical concentration process, such flake being made up of a number of parallel laminae, which may be separated by mechanical means.

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[1] Work on manuscript completed June, 1931.

The duties imposed by this act are the same as those of the act of 1922 on amorphous graphite but are 50 per cent higher on crystalline lump, chip, or dust and 10 per cent higher on crystalline flake.

PRODUCTION

In the following discussion the quantity and value of graphite sold or used by producers in the United States are presented as the best available measure of output.

During 1930 sales of amorphous and crystalline graphite in the United States showed large decreases in comparison with 1929. Sales of amorphous graphite decreased 1,614 short tons, or 45 per cent, in quantity and $26,125, or 56 per cent, in value and reached the lowest level in many years. Sales of crystalline graphite decreased in even greater proportion; the quantity was the lowest since 1888 and the value was the lowest in the history of the industry; as only two operators reported sales of crystalline graphite in 1930, definite figures for sales of this material are not available for publication. Only one amorphous graphite mine was in operation in 1930, that of the Carson Black Lead Co. in Nevada; two other operators used or sold material from stock mined previously.

The States contributing to the total in 1930 were Alabama, Michigan, Nevada, and Rhode Island. Alabama was the only State reporting sales of crystalline graphite on a commercial scale; the producers were the Bama Graphite Mines, Mountain Creek, with office at Montgomery, and the Superior Flake Graphite Co., Ashland, with office at Chicago, Ill. Experimental and assessment work was done in California and Montana, but there was no commercial production.

Three States reported amorphous graphite sold or used by the producer in 1930: Rhode Island, Nevada, and Michigan, named in order of importance. The only operators reporting were the Detroit Graphite Co., Detroit, Mich., with mine at L'Anse, Mich.; the Carson Black Lead Co., Oakland, Calif., with mine at Carson, Nev.; and the Graphite Mines Co., Providence, R. I., with mine at Cranston, R. I.

Natural graphite sold or used by producers in the United States, 1921–1930

Year	Number of operators reporting sales	Amorphous		Crystalline		Total value
		Short tons	Value	Pounds	Value	
1921	8	1,842	$20,860	1,189,523	$75,664	$96,524
1922	7	2,200	(1)	1,849,766	85,242	(1)
1923	7	4,056	39,560	3,964,900	151,434	190,994
1924	5	4,071	38,533	1,800,325	48,977	87,510
1925	6	3,536	39,640	2,257,250	56,721	96,361
1926	6	2,975	40,500	4,989,200	178,842	219,342
1927	9	2,595	35,850	5,224,400	197,121	232,971
1928	9	2,994	43,320	5,233,300	253,773	297,093
1929	8	3,555	46,650	5,806,410	264,241	310,891
1930	5	1,941	20,525	(1)	(1)	(1)

[1] Bureau of Mines not at liberty to publish figures.

USES

Crystalline graphite was reported as having been sold in 1930 for use in crucibles, foundry facings, dry batteries, greases, and stove polish. Amorphous graphite was reported as having been used for foundry facings and paint.

MANUFACTURED GRAPHITE

In 1930 the manufacture of graphite was continued by the Acheson Graphite Co. at Niagara Falls, N. Y., and by the American Cyanamid Co. at Linden, N. J. The Bureau of Mines is not at liberty to publish figures of production for years following 1927, as doing so would disclose confidential information. In common with production in other branches of the graphite industry, the output of manufactured graphite decreased considerably in quantity and value in 1930 as compared with 1929 and was the smallest for many years. Artificial graphite was reported as having been sold in 1930 for use in batteries, brushes, and electrodes and for other uses.

PRICES

The average value of domestic crystalline graphite at the mine ranged from 2 to 5 cents per pound in 1930 as compared with 1½ to 5.8 cents per pound in 1929. The general average value of domestic crystalline graphite was 3½ cents per pound in 1930 as compared with 4.6 cents per pound in 1929.

The figures in the following table have been furnished by Charles Pettinos, of New York City.

Average prices of Ceylon graphite, c. i. f. New York, 1921–1930, in cents per pound

Year	Lump		Chip		Dust		Remarks
	First grade	Second grade	First grade	Second grade	First grade	Second grade	
1921	5½–6	4½–5	4½–5	3½–4	3¼–3¾	2 –2½	Low throughout the year.
1922	5 –6	4 –4½	3¾–4¼	3¼–3¾	3 –3½	2 –2½	Do.
1923	5 –6	4 –4½	3¾–4¼	3¼–3¾	3 –3½	2 –2½	Do.
1924	5½–7	4½–6	4 –6	3½–5	3¼–4½	2 –3	Low first three-quarters; high last quarter.
1925–1930	7½–9½	6½–8½	6½–7½	5½–6½	3½–5½	3 –4½	High throughout the year.

Pettinos has also furnished the following information: The price range for 1930 for Madagascar graphite was 6 to 7 cents per pound, ex dock at New York, including duty and other charges.

The exports from Madagascar are virtually all of one quality, called "Standard No. 1 Flake," the grade that the French Government is attempting to have the producers maintain and that has a graphitic carbon content of approximately 85 per cent. The size of grain runs from 20 to 60 mesh, practically all passing 20 mesh and all remaining on 60 mesh.

IMPORTS AND EXPORTS [2]

In 1930 both the quantity and the value of the graphite imported for consumption decreased sharply in comparison with 1929; the quantity decreased 31 per cent and the value 41 per cent. The decrease in quantity was principally in the crystalline variety; the decrease in value was entirely in that variety, the value of imported amorphous showing an increase of 12 per cent as compared with 1929.

Amorphous graphite comprised 65 per cent of the total quantity imported, and its value constituted 34 per cent of the total value. The value of the crystalline graphite imported was 66 per cent of the total in 1930 as compared with 82 per cent in 1929.

The reports of the Bureau of Foreign and Domestic Commerce on imports show only the country from which the graphite is shipped, which is not always the country of origin. For instance, the graphite shown as imported from France probably came principally from Madagascar, that from the United Kingdom should probably be credited to Ceylon and Madagascar, and that from Belgium no doubt originated in Italy. The shipments credited to Japan probably consisted wholly of graphite from Chosen.

Graphite imported for consumption in the United States, 1921–1930, by kinds

Year	Amorphous		Crystalline chip or dust		Crystalline flake		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1921	(1)	(1)	(1)	(1)	(1)	(1)	8,183	$452,076
1922							12,488	473,046
1923	11,252	$149,831	7,243	$426,417	939	$37,871	19,434	614,119
1924	10,936	113,751	3,998	197,867	1,441	87,893	16,375	399,511
1925	9,210	143,750	5,904	389,242	2,654	293,418	17,768	826,410
1926	8,250	161,564	5,258	433,848	2,658	325,821	16,166	921,233
1927	9,559	146,881	6,116	390,822	1,777	186,220	17,452	723,923
1928	7,699	107,936	7,143	452,424	2,727	241,199	17,569	801,559
1929	12,041	189,198	8,304	546,668	3,727	330,968	24,072	1,066,834
1930	10,926	212,614	3,071	186,616	2,729	225,438	16,726	624,668

[1] Not separately classified prior to 1923.

Graphite imported into the United States, 1925–1930

[General imports]

Country	1925		1926		1927	
	Short tons	Value	Short tons	Value	Short tons	Value
Canada	2,268	$123,823	2,633	$178,249	1,676	$98,079
Ceylon	5,616	365,371	4,795	390,336	5,957	367,593
China	88	1,502	----	----	9	692
Chosen	439	5,330	(a)	(a)	(a)	(a)
France	2,052	230,056	723	96,811	1,419	156,154
French Indo-China	----	----	----	----	2	173
Germany	25	3,256	126	13,217	7	1,089
India (British)	5	150	122	8,170	----	----
Italy	575	16,688	105	2,291	27	694
Japan	191	9,983	[a] 880	[a] 21,794	[a] 1,834	[a] 25,176
Java and Madura	----	----	61	4,041	----	----
Madagascar	168	10,466	1,014	108,846	162	12,459
Mexico	6,159	39,119	5,238	45,968	6,283	53,837
Morocco	----	----	----	----	42	4,529
Norway	----	----	14	2,078	1	61
Switzerland	13	1,600	----	----	3	471
United Kingdom	180	20,738	483	51,712	7	997
	17,779	828,082	16,194	923,513	17,429	722,004

[a] Chosen included with Japan.

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[2] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Graphite imported into the United States, 1925–1930—Continued

Country	1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value
Australia			5	$396		
Belgium	57	$4,451	34	4,665		
Canada	1,048	45,594	1,756	97,254	2,219	$117,117
Ceylon	6,606	421,084	7,968	518,344	4,056	217,038
China			3	97	2	31
Chosen	(a)	(a)	(a)	(a)	(a)	(a)
Czechoslovakia			44	1,093	17	428
France	2,351	213,319	2,787	252,701	1,184	114,057
Germany	63	5,986	11	2,650	27	8,400
Hong Kong					(b)	8
India (British)	234	4,203				
Italy	119	3,065	189	4,456	132	6,136
Japan	[a] 1,643	[a] 25,356	[a] 1,362	[a] 23,032	[a] 1,173	[a] 13,906
Madagascar	494	37,661	1,248	85,727	1,454	95,355
Mexico	5,225	46,988	8,547	72,556	6,460	51,267
Norway			1	155		
Soviet Russia	1	46				
Switzerland			(b)	13		
United Kingdom	2	804	6	2,047	2	925
	17,843	808,557	23,961	1,065,186	16,726	624,668

[a] Chosen included with Japan.

[b] Less than 1 ton.

Graphite exported from the United States, 1921–1930

Year	Unmanufactured graphite		Manufactures of graphite [1]	Year	Unmanufactured graphite		Manufactures of graphite [1]
	Short tons	Value			Short tons	Value	
1921	921	$95,998	$679,359	1926	405	$49,235	$463,084
1922	569	78,094	255,019	1927	[2] 1,819	[2] 435,997	(2)
1923	908	138,542	335,778	1928	[2] 2,203	[2] 454,770	(2)
1924	1,022	144,108	250,957	1929	[2] 1,613	[2] 370,013	(2)
1925	945	142,122	337,481	1930	[2] 1,556	[2] 418,430	(2)

[1] After 1921, exclusive of crucibles, figures for which are not available.

[2] Classification from 1927 to 1930 reads "Graphite and manufactures, except crucibles."

WORLD PRODUCTION

The following table shows, so far as figures are available, the production of natural graphite throughout the world from 1926 to 1930.

World production of natural graphite, 1926–1930, in metric tons

[Compiled by M. T. Latus, of the Bureau of Mines]

Country [1]	1926	1927	1928	1929	1930
Australia: New South Wales	----------	10	----------	51	(2)
Austria	14,756	18,058	24,226	25,296	17,689
Brazil [3]	----------	----------	9	15	10
Canada	2,474	1,659	995	1,325	1,393
Ceylon [3]	11,810	13,091	14,576	12,942	8,891
Chosen [3]	18,692	20,331	23,095	24,645	20,962
Czechoslovakia	30,818	41,113	32,332	23,651	(2)
France	950	900	900	780	(2)
Germany (Bavaria)	14,304	17,773	17,464	21,349	24,996
India, British	----------	----------	----------	40	(2)
Indo-China	[4] 815	[4] 410	----------	----------	(2)
Italy	9,605	8,395	7,030	[5] 7,470	5,600
Japan	498	633	442	308	(2)
Madagascar [3]	11,454	14,329	13,897	16,049	9,222
Mexico (amorphous)	4,435	6,818	5,257	5,721	5,853
Russia [6]	6,425	6,857	2,222	(2)	(2)
Spain	603	352	----------	----------	(2)
Union of South Africa	46	58	51	53	51
United States:					
Amorphous	2,699	2,354	2,716	3,225	1,761
Crystalline	2,263	2,370	2,374	2,634	(7)

[1] In addition to the countries listed Argentina reports shipments of 2 tons of graphite in 1927; Tanganyika Territory, a production of 6 tons in 1928; and French Morocco, exports of 104 tons in 1929.

[2] Data not available.

[3] Exports.

[4] Concentrates.

[5] Includes 360 tons of anthracitic graphite.

[6] Year ended Sept. 30.

[7] Bureau of Mines not at liberty to publish figures.

An inspection of this table shows that the output of graphite increased in 1930 as compared with 1929 in three of the countries for which 1930 production data are available—Canada, Germany, and Mexico. The increase in production in these countries was 5, 17, and 2 per cent, respectively. The United States affords the chief market for Mexico, and shipments (imports) from Mexico to the United States in 1930 decreased 2,087 short tons, or 24 per cent. Thus, the marketed production in Mexico decreased considerably as compared with 1929.

INTERNATIONAL GRAPHITE TRADE, FIRST SIX MONTHS OF 1930

The following paragraphs are quoted from a paper on the international graphite trade, first six months of 1930, by Martha M. Taylor, of the minerals division, Bureau of Foreign and Domestic Commerce, published by the United States Department of Commerce in Commerce Reports 52, December 29, 1930.

So far as the trade of the United States is indicative of world demand for graphite, the first half of the present year evidenced a continuation of trends shown in 1928 and 1929. Receipts of amorphous graphite were a little higher than in the corresponding period of 1929, and those of crystalline graphite were conspicuously less. Total imports of graphite were less than those for the first half of 1929. This decline in demand was reflected in lower output in the principal producing countries, where production is approximately the same as total exports. The export statistics of Madagascar and Ceylon have indicated declines since 1928, whereas Chosen, with a larger production than either, recorded a small advance even in the first part of the present year—all in the amorphous variety, as a slight decline was apparent in exports of crystalline graphite. South Africa registered a decided decrease in 1930, and some decline was indicated in Mexican figures.

The United States has a small domestic production of natural graphite, almost entirely amorphous, amounting to about 22½ per cent of the visible consumption in 1928 and 25 per cent in 1929. In recent years the supply of natural graphite has been supplemented by artificial graphite, the manufacture of which exceeded production of domestic natural graphite from 1921 to 1928, but fell somewhat below in 1929. * * *

SIX-MONTHS' IMPORTS OF TWO YEARS COMPARED

Total imports of graphite into the United States during the first six months of this year and last are shown in the following table:

Imports of graphite into the United States

Source	January-June, 1929			January-June, 1930		
	Amorphous	Lump	Flake	Amorphous	Lump	Flake
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Canada	1,433,280	74,380	369,000	2,336,720	391,950	277,228
Czechoslovakia				34,793		
France	21,947	392,913	2,303,496	244,521	55,225	1,537,474
Germany	6,940	22		10,954	2,000	
Italy	110,230	112,000				44,136
Belgium	68,969					
United Kingdom		4,704			3,360	
Mexico	11,432,849			9,484,488		
Ceylon	180,238	8,137,697		1,436,933	4,811,934	
Madagascar			1,579,896			1,468,670
Japan	640,150			1,010,550		
China						4,000
Other countries		400	4,530			
Total	13,894,603	8,722,116	4,256,922	14,558,959	5,264,469	3,331,508

THE GRAPHITE INDUSTRY AND EXPORTATION IN CHOSEN

The declining demand for graphite and its lower prices have affected operations in most of the producing countries during the present year. In Chosen the decrease in production has been smaller than it has elsewhere and largely confined to crystalline graphite. As the amorphous variety comprises the bulk of the output the total production was larger this year than last. Chosen has little local consumption of graphite and does not retain stocks; its production, therefore, is practically synonymous with its exports to China and Japan. Shipments to the United States, the United Kingdom, and other countries are transshipped in Japan. The removal of the Japanese embargo on exportation of gold last January reacted unfavorably on the graphite market in Chosen during the first months of the present year. Another drawback was the extreme cold which caused suspension of mining operations in the Shingishu region. With the advance of spring, operations were resumed and the exports of the second quarter of the year were considerably larger than those of the first three months. It is reported that Japan has increased its own purchases of amorphous graphite for the manufacture of nitrogenous fertilizers.

INCREASING ACCUMULATION OF STOCKS IN MADAGASCAR

Comparison of figures for the half-year periods of 1928 and 1929 shows Madagascar changing from second to third place as a source of graphite for the United States. American imports from both Madagascar and Ceylon declined during this interval, but those from Madagascar much more rapidly, so far as January-June receipts are concerned. In May, 1930, commercial estimates placed the monthly rate of production in Madagascar at 300 metric tons and current stocks at 2,000 tons, of which 1,100 tons represented carry over from 1929 operations.

These estimates later proved to be much too low for both stocks and current production. In September it was reported that existing stocks ready for shipment had reached approximately 5,000 tons, and it appeared probable that additional stocks of considerable size were at the smaller mines, with shipments thus far in 1930 ranging from 500 to 1,000 tons monthly. Despite the closing of a number of small mines monthly production probably was maintained at 800 tons or more.

SUSPENSION OF OPERATIONS IN MANY CEYLON MINES

In Ceylon, graphite mines under operation numbered 281 at the beginning of 1929 and only 74 at the end of the year. In October, 1930, it was said that only two mines were being operated, and that the closed mines could not reasonably be expected to be workable after the next monsoon. Stocks on hand are reported small, notwithstanding reduced exports, and local dealers expect increased prices next year as a result of shortage. The present reduction in demand for Ceylon graphite is attributed to the decreasing manufacture of graphite crucibles and to competition from Madagascar graphite—said to have lower production costs. The decline in production and demand was apparent in the Ceylon industry in 1929 and, in fact, has caused some depression for a period of years. The change has been much more rapid during the present year.

MEXICO SUPPLIES ONLY AMORPHOUS GRAPHITE

Mexican production figures for 1930 are not available, but import figures for the United States indicate only a small decrease. Sonora produces the bulk of the Mexican graphite, all of which is amorphous. The entire output is regularly exported, most of it to the United States, and the American market, therefore, regulates operations. Since United States imports from Mexico in the first half of the present year exceeded the recorded production for the corresponding period of 1928, it seems probable that the Mexican industry has not felt the decline in so great a degree as other countries.

CRYSTALLINE GRAPHITE LARGELY FROM CEYLON

Canada produces both amorphous and crystalline graphite—the former in larger quantities. This is the only source of the crystalline variety adjacent to the United States. United States figures show considerable imports of the crystalline flake from France, but these are mostly transshipments from Madagascar, French domestic production being small. There is some crystalline production in Czechoslovakia, but most of the American receipts from that country, either direct or through Germany, consist of the amorphous variety. Except for transshipments, or small and irregular receipts, the United States obtains its crystalline graphite from Ceylon and Madagascar, most of it from the former in recent years.

Prior to 1929 the United States purchased small amounts of amorphous graphite from Russia, but the Russian reserves have not yet been made fully available. The deposit most carefully prospected and reported so far is in North Siberia and has been estimated to contain more than 2,000,000 tons of amorphous graphite. More recently it has been reported that a deposit of crystalline flake graphite has been discovered in the region of Pribourg in the Ukraine. A first estimate places this deposit at 275,000 tons of graphite, which appears to resemble that from Ceylon.

PRODUCTION IN PRINCIPAL COUNTRIES OF ORIGIN

The following table shows graphite production in certain of the principal sources of American supply during the first half of the present year, compared with the corresponding months of 1928 and 1929:

Production of graphite in important countries of origin

Country of origin	First six months of—		
	1928	1929	1930
	Pounds	*Pounds*	*Pounds*
Chosen:			
Crystalline	1,344,374	1,350,065	1,335,640
Amorphous	21,693,536	22,719,779	22,993,975
Ceylon	16,584,064	15,117,344	12,825,924
Madagascar	18,428,251	17,486,887	10,332,960
Mexico	8,163,870	11,019,678	(1)
South Africa	67,424	68,320	60,077

(1) Not available.

PRESENT TREND OF EXPORTS FROM VARIOUS PRODUCING COUNTRIES

The higher price for crystalline graphite is only partially due to its greater rarity; another cause is the greater expense of mining it, since it is ordinarily found in rather narrow veins. The cheap native labor in Ceylon and Madagascar is partly accountable for their position as the most prolific sources of that variety. Reports from Ceylon indicate an unchanged demand from European markets and attribute the entire decline of the industry to the United States, while from Madagascar it was reported in August, 1930, that the orders from Europe also were much below normal.

The crystalline deposits in Canada and the United States are mostly too small and too inconvenient in occurrence to make extensive exploitation profitable. No important quantities of this variety are produced elsewhere in North or South America. Of sources at a greater distance, the principal one [Ceylon] appears to be about to reduce its contributions very considerably, and the crystalline graphite from Madagascar is largely received through France. The crystalline output of Czechoslovakia is mostly absorbed elsewhere in Europe, which seems likely to furnish a sufficient outlet also for any which may be produced from the new source in Russia. There is some crystalline production in Chosen, but this goes regularly to European consumers. Further substitution of the amorphous variety, or some other adjustment of the United States demand, may become one of the factors of the graphite trade in the near future.

GRAPHITE MINING IN CEYLON

The following extract from the Mining Journal (London), January 3, 1931, page 6, is of interest.

Faced with the situation that Ceylon graphite—the world's best found in such abundance in the Island—is threatened with effacement from the world's markets, a number of leading shippers and brokers dealing in this commodity met at a conference in Colombo and have arrived at an agreement which, they maintain, is designed to arrest the downfall threatening the industry in Ceylon.

With regard to the present system of buying and selling prevailing in this country the Conference came to the conclusion that it is very unsatisfactory. Dealers made bargains individually and attempts to corner the market were discovered. The Conference therefore agreed that a buying pool should be organized in Colombo and that the price of the commodity from X B to dust, in all three grades of plumbago, be fixed in conformity with the prices ruling in the world markets. It was pointed out that at present, in spite of the general trade depression, very fair prices were obtainable for Ceylon plumbago, although the almost fabulous pre-war prices were unthinkable.

At the Conference an agreement was entered into by the shippers, and it is understood that there will not be any competition or undercutting on the part of any one. This step is considered to be the most feasible for the purpose of keeping the prices level and in a measure capable of maintaining the industry which has almost reached the point of extinction.

The Ceylon Plumbago Association has also forwarded, through the Governor, a memorial stating that unless the British Government came to the aid of the Ceylon industry by giving preference against Madagascar and other foreign graphite, the local industry was in danger.

Owing to the keen competition of Madagascar and Korean graphite the Ceylon product has lost its position in the world's graphite market. Not only has the quantity exported from Ceylon dropped, but the prices too have touched such a low level that many mines have been closed down and large stocks are remaining in the stores. It is admitted that the quality of the Ceylon graphite can not be approached by any other variety in the world; and consumers economically bent are said to be reducing their purchases from Ceylon, and by a judicious mixture of cheaper qualities from other countries meet the demands required.

An article in the Mining Journal (London), May 16, 1931, page 395, comments further upon the activities of the Ceylon Plumbago Association.

The report read at the annual meeting of the Ceylon Plumbago Association outlines in detail the position of the industry which is now in a sad plight. It was resolved to write to the Colonial Secretary to obtain for the information of the

Association from the British Consul in Madagascar a report on the plumbago industry in Madagascar.

The report of the Association for last year states that the exports of Ceylon plumbago show a decrease over 1929 of 3,942 tons, and the average price fell from Rs.214.50 to Rs.203.50 a ton. The decrease is mainly accounted for by the shipments to America which were less in comparison by 3,311 tons. The lower average price was accounted for by the lessened shipments of crystalline flake plumbago and the increased shipments of the cheaper or amorphous plumbago.

The increased use of carborundum, the product of the electric furnace, is having a decided influence on the demand for plumbago. The carborundum crucible, unlike the plumbago crucible, requires no preliminary heating. This obviates storing in heated drying rooms and so valuable space is saved as smaller stocks can be carried.

The Madagascar exports to the United States have decreased in greater proportion than Ceylon's. The United States continues to take its crystalline plumbago from Ceylon and Madagascar, but Ceylon has in recent years had the preference, no doubt on account of the low prices that have been prevailing.

SILICA [1]

By E. R. Phillips [2]

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INTRODUCTION

Silica (SiO_2) occurs in deposits of commercial importance in many different forms, such as vein quartz, as a constituent of pegmatites, as sand, sandstone, quartzite, or flint, as tripoli, and as diatomite or diatomaceous earth. In some forms, such as rose, smoky, and amethystine quartz, it has value as gems. This chapter deals with silica of all kinds except gem quartz, silica sand or sandstone used for making glass, and silica used in the form of sand, gravel, and crushed material for building, for concrete and mortar, for foundry and furnace work, and for cutting and grinding stone. Such material as is not included here is either gem material or sand, is commercially so designated, and is therefore considered in other chapters of Mineral Resources. Tripoli and diatomite were, in the past, largely consumed as abrasives and are considered in the chapter on Abrasive Materials; however, both are finding increasing markets for other than abrasive purposes. As it is impossible to separate the figures in order to show the quantities used for other purposes, the figures given here for diatomite and tripoli are duplicated in the abrasive chapter.

For a comprehensive discussion of the occurrence, mining or quarrying, methods of preparation, and uses of the various forms of silica, the reader is referred to a report by W. M. Weigel, Technology and Uses of Silica and Sand, Bulletin 266, Bureau of Mines, 1927, which may be procured from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 40 cents a copy.

PRODUCTION

The production of quartz (crude, crushed, and ground) from pegmatite dikes, from veins, and from quartzite decreased 37 per cent in quantity and 41 per cent in value in 1930, as compared with 1929. Ground sand and sandstone decreased 20 per cent in quantity and 23 per cent in value.

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[1] Work on manuscript completed August, 1931.

[2] Figures on imports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Silica sold or used by producers in the United States for pottery, paints, fillers, polishers, abrasives, and other uses, 1928–1930

Material	1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value
Quartz (vein quartz, pegmatite, and quartzite)	22,198	$209,333	20,981	$205,759	13,156	$121,289
Sand and sandstone [1]	280,402	1,966,296	302,139	2,039,144	241,947	1,566,815
Tripoli (including rottenstone) (ground and otherwise prepared)	34,043	555,576	38,011	545,658	32,439	507,505
Diatomite	(2)	(2)	(2)	(2)	(2)	(2)
	(2)	(2)	(2)	(2)	(2)	(2)

[1] Includes only finely ground material. Figures probably incomplete.
[2] Bureau of Mines not at liberty to publish figures for diatomite.

QUARTZ

The States that reported production of quartz (from pegmatite dikes, from veins, and from quartzite) in 1930 were California, Maine, Maryland, Massachusetts, New Hampshire, New York, North Carolina, Washington, and Wisconsin. Wisconsin led in quantity and value of quartz reported by producers; North Carolina ranked second.

The total quantity of crude, crushed, and ground quartz sold or used by producers in 1930 amounted to 13,156 short tons, valued at $121,289. This output consisted of 6,521 tons of crude quartz, valued at $26,410; 841 tons of crushed quartz, valued at $6,121; and 5,794 tons of ground quartz, valued at $88,758.

Some of the crude quartz included in the foregoing figures was purchased by grinders in New Jersey, Pennsylvania, and Tennessee who reported an additional production of 6,707 tons of ground quartz, valued at $122,616. This output of ground quartz, with the 5,794 tons reported by grinders who produced their own crude material, made a total of 12,501 tons of ground quartz, valued at $211,374.

Average values f. o. b. mines for the crude quartz reported by individual producers ranged from $2 to $7 a short ton, with an average sales value of $4.05 for the total quantity of crude quartz reported for the country. Average values f. o. b. plant for the crushed quartz ranged from $5.98 to $11, with an average sales value of $7.28 a ton for the total output.

Average values for the ground quartz reported by individual producers ranged from $5.50 to $30.03 a ton, with an average sales value for all ground quartz considered here of $16.91 a ton.

The total production of quartz—crude, crushed, and ground—including that manufactured from purchased crude by the grinders represented the output of 24 producers with 25 plants.

The uses to which this quartz was put, as reported by the producers, were as follows: Tile and other ceramic products, flux in steel foundries, roofing, base in paints, cleansers, sandpaper, refractories and abrasives, packing acid towers and filters, pulp burrs, matches, and fused quartz lenses.

Quartz sold or used by producers in the United States, 1921–1930

Year	Crude [1]		Ground [2]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1921	8,570	$39,660	2,682	$45,297	11,252	$84,957
1922	5,085	23,093	5,568	78,254	10,653	101,347
1923	14,159	66,723	6,442	126,907	20,601	193,630
1924	20,570	123,099	3,191	80,078	23,761	203,177
1925	22,312	143,861	3,132	61,515	25,444	205,376
1926	22,230	159,052	5,513	115,281	27,743	274,333
1927	18,504	124,021	3,640	70,019	22,144	194,040
1928	15,363	79,229	6,835	130,104	22,198	209,333
1929	13,104	59,257	7,877	146,502	20,981	205,759
1930	7,362	32,531	5,794	88,758	13,156	121,289

[1] Includes some crushed quartz.

[2] In order to avoid duplication, the ground material shown here is only that ground by the original producers of the crude quartz or by grinders who purchase from small miners not reporting their production.

Quartz (crude, crushed, and ground [1]) sold or used by producers in the United States, 1928–1930, by States

State	1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value
California	5,719	$47,789	5,573	$58,807	[2] 2,895	[2] $22,762
Maryland	3,515	10,466	3,670	8,875	[2] 1,584	[2] 4,123
Massachusetts	(3)	(3)	(3)	(3)	765	5,500
Nevada	(3)	(3)	346	2,358	----------	----------
New Hampshire	376	2,593	(3)	(3)	132	396
North Carolina	4,113	40,128	2,493	28,709	2,981	23,838
Undistributed [4]	8,475	108,357	8,899	107,010	4,799	64,670
	22,198	209,333	20,981	205,759	13,156	121,289

[1] In order to avoid duplication, the ground material included is only that ground by the original producers of the crude quartz or by grinders who purchase from small miners not reporting their production.

[2] Partly estimated.

[3] Included under "Undistributed."

[4] 1928: Massachusetts, Nevada, New York, Pennsylvania, Washington, and Wisconsin; 1929: Maine, Massachusetts, New Hampshire, New York, Virginia, Washington, and Wisconsin; 1930: Maine, New York, Washington, and Wisconsin.

Following is a list of manufacturers of ground quartz; some of the company changes that occurred during the year are indicated.

American Encaustic Tiling Co. (Ltd.), 2030 East Fifty-second Street, Los Angeles, Calif.

Baeder-Adamson Co., Philadelphia, Pa. (succeeded by Minnesota Mining & Manufacturing Co., St. Paul, Minn.).

Charlotte Chemical Laboratories (Inc.), Charlotte, N. C.

Erwin Feldspar Co. (Inc.), Erwin, Tenn.

Eureka Flint & Spar Co., Trenton, N. J.

Flynt Silica & Spar Co., 1047 Richmond Street, Los Angeles, Calif. (succeeded by Consolidated Feldspar Corporation, Trenton, N. J.).

Maryland Quartz Co., 73 Munsey Building, Baltimore, Md. (plant destroyed by fire in October, 1930).

Minnesota Mining & Manufacturing Co., St. Paul, Minn.

H. P. Scheel Eversharp Pulp-Burr Co., 520 North G Street, Tacoma, Wash.

Spicky Polish Corporation, 1401 Third Street, San Francisco, Calif.

Standard Flint & Spar Corporation, Trenton, N. J.

Trenton Flint & Spar Co., Marion Street, Trenton, N. J. (succeeded by Consolidated Feldspar Corporation, Trenton, N. J.).

United States Sandpaper Co., Williamsport, Pa. (succeeded by Behr-Manning Corporation, Troy, N. Y.).

"Crushed" quartz was reported by the Cheshire White Quartz Sand Co., Cheshire, Mass., and the Day Quartz Co., Sykesville, Md. The Day Quartz Co., which has previously sold crude quartz but is now crushing and screening the material, will soon have a grinding plant completed. The Enos Adams Co., Bennington, Vt., reported "mine closed"; the San Jacinto Rock Products Co., San Jacinto, Calif., reported that it went out of business late in 1929; these two companies have been producers of the crushed material in previous years.

Following is a list of some producers and sellers of crude quartz who have produced in recent years or who will produce when market offers:

Apex Engineering Co., 609 Rookery Building, Spokane, Wash.
Apex Quartz Co., St. Clair, Mo.
Gottlieb Baer, Marriottsville, Md.
P. Carmean, Le Grand, Calif.
Carolina Minerals Co., Spruce Pine, N. C.
Charlotte Chemical Laboratories (Inc.), Charlotte, N. C.
Consolidated Feldspar Corporation, Trenton, N. J.
Crystal Quartz Co., 1289 Sunset Boulevard, Los Angeles, Calif.
J. W. Cummings Feldspar Co., Bath, Me.
Day Quartz Co., Sykesville, Md.
Eureka Flint & Spar Co., Trenton, N. J.
F. B. Fortner, Spruce Pine, N. C.
Gold Cliff Central Mining Co., Kingman, Ariz.
Golding-Keene Co., Keene, N. H.
C. L. Graber, Cleveland, Ohio.
L. I. Green, Owings Mills, Md.
John T. Hanley, R. F. D., West Rumney, N. H.
Oscar Lauger, Escondido, Calif.
Maine Feldspar Co., Brunswick, Me.
Minnesota Mining & Manufacturing Co., St. Paul, Minn.
Northwest Mineral Products Co., Tacoma, Wash.
W. H. O'Dell, Randallstown, Md.
J. R. Oursler, Marriottsville, Md.
Perris Mining Co., Perris, Calif.
Anthony Pesente, Woodbury, Conn.
J. C. Pitman, Penland, N. C.
Wm. Retallick, Roxbury Station, Conn.
H. T. A. Rhodewalt, Nottingham, Pa.
C. L. Roesbery, Yermo, Calif.
H. P. Scheel Eversharp Pulp-Burr Co., 520 North G Street, Tacoma, Wash.
Galen Sparks, Spruce Pine, N. C.
Spicky Polish Corporation, 1401 Third Street, San Francisco, Calif.
N. M. Sweetser, 4235 Monroe Street, Los Angeles, Calif.
Trenton Flint & Spar Co., Marion Street, Trenton, N. J.
John Wallen, Marriottsville, Md.
Geo. W. Wheatley, Moneta, Va.
Whitehall Co. (Inc.), 17 Battery Place, New York, N. Y.
W. M. Yox, Reisterstown, Md.

GROUND SAND AND SANDSTONE

Ground sand and sandstone amounting to 241,947 short tons, valued at $1,566,815, were sold or used in 1930 by producers in California, Illinois, Missouri, New Jersey, Ohio, Pennsylvania, West Virginia, and Wisconsin. The average values of the output of the individual producers ranged from $3.27 to $18.28 a short ton, with an average sales value for the total output of $6.48 a ton. There is a great variation in the purity, fineness, and perfection of sizing of the ground sand and sandstone produced, which results in a wide range of average values for the output of the individual operators.

The following producers reported ground sand or sandstone in 1930:

Central Silica Co., Glass Rock, Ohio.
Del Monte Properties Co., 401 Crocker Building, San Francisco, Calif.
Eureka Flint & Spar Co., Trenton, N. J.
Michigan Quartz Silica Co., Milwaukee, Wis.
National Pulverizing Co., Millville, N. J.
National Silica Co., Oregon, Ill.
National Silica Works, Berkeley Springs, W. Va.
New Jersey Pulverizing Co., 15 Park Row, New York, N. Y.
Ottawa Silica Co., Ottawa, Ill.
Pennsylvania Glass Sand Co. (grinds in New Jersey, Pennsylvania, and West Virginia), Lewistown, Pa.
Pioneer Silica Products Co., Pacific, Mo.
Potters Mining & Milling Co., East Liverpool, Ohio.
Standard Flint & Spar Corporation, Trenton, N. J.
Standard Silica Co., 120 South La Salle Street, Chicago, Ill.
Trenton Flint & Spar Co., Marion Street, Trenton, N. J.
Wedron Silica Co., First National Bank Building, Chicago, Ill.
White Rock Silica Co., 21 North Curtis Street, Chicago, Ill.

Ground sand and sandstone sold or used by producers in the United States, 1921–1930 [1]

Year	Short tons	Value	Year	Short tons	Value
1921	105.887	$802,450	1926	270,468	$1,928,793
1922	163,295	1,061,057	1927	275,737	1,897,303
1923	249,467	1,672.961	1928	280,402	1,966,296
1924	230,432	1,655,056	1929	302,139	2,039,144
1925	263,981	1,857,263	1930	241,947	1,566,815

[1] Includes only finely ground material. Figures probably incomplete.

Ground sand and sandstone sold or used by producers in the United States, 1929 and 1930, by States [1]

	1929		1930	
	Short tons	Value	Short tons	Value
Illinois and Missouri	94,920	$580,649	74,198	$453,310
New Jersey	83,304	350,480	77,813	315,984
Virginia	56,601	496,626	----------	----------
West Virginia			(2)	(2)
Undistributed [3]	67,314	611,389	89,936	797,521
	302,139	2,039,144	241,947	1,566,815

[1] Includes only finely ground material. Figures probably incomplete.

[2] Included under "Undistributed."

[3] 1929: California, Ohio, Pennsylvania, and Wisconsin; 1930: California, Ohio, Pennsylvania, West Virginia, and Wisconsin.

IMPORTS

Data on imports of silica materials are found in the records of the Bureau of Foreign and Domestic Commerce under the classifications "silica, crude," "silica, for use as pigment," and "flint, flints, and flint stones, unground."

No imports of crude silica have been recorded since 1927, when 12 short tons, valued at $175, were reported as received from the Philippine Islands; imports in 1926 amounted to 27 tons, valued at $149, and in 1925 to 22 tons, valued at $486. Imports of silica for use as pigment were not separately recorded until 1927, when they amounted to 22 short tons, valued at $535; none have been recorded since 1927.

The imports of "flint, flints, and flint stones, unground," are flint pebbles for grinding mills and for other uses indicated in this report; imports for consumption amounted to 6,856 short tons, valued at $62,463, in 1930, as compared with 14,097 tons, valued at $127,457, in 1929, a decrease of 51 per cent in both quantity and value.

Imports of "flint, flints, and flint stones, unground," from France in 1930 amounted to 47 per cent of the total quantity imported; from Denmark, 43 per cent; and from Belgium, 9 per cent. The remaining 1 per cent came from Germany, the United Kingdom, and Japan.

The values assigned to the imports considered in the following tables are those upon which the import duties in the United States are levied and represent the foreign market value (or the export value, if higher) plus cost of containers and all expenses incident to placing merchandise ready for shipment to the United States, including export tax, if any.

"Flint, flints, and flint stones, unground," imported for consumption in the United States, 1921–1930

Year	Short tons	Value	Year	Short tons	Value
1921	10, 084	$116, 157	1926	15, 091	$120, 078
1922	16, 040	145, 805	1927	15, 191	93, 658
1923	15, 952	130, 974	1928	15, 719	144, 313
1924	17, 473	114, 958	1929	14, 097	127, 457
1925	16, 240	105, 041	1930	6, 856	62, 463

"Flint, flints, and flint stones, unground," imported into the United States, 1928–1930, by countries

[General imports]

Country	1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value
Argentina			11	$129		
Belgium	969	$18, 379	1, 436	25, 378	644	$10, 458
Canada	44	384				
Denmark	6, 716	74, 595	3, 365	34, 160	2, 958	30, 670
France	7, 816	49, 190	9, 157	66, 327	3, 183	20, 406
Germany	20	447	78	1, 192	58	704
Japan					1	30
Netherland East Indies ("Other")	61	470				
Sweden	59	675				
United Kingdom	34	173			12	195
	15, 719	144, 313	14, 047	127, 186	6, 856	62, 463

SULPHUR AND PYRITES[1]

By Robert H. Ridgway[2]

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SUMMARY

Although the depression of 1930 affected most industries adversely, world sulphur production went forward without abatement, surpassing the record total of the preceding year. The demand for sulphur declined substantially, however, and stocks were accumulated in the principal producing countries.

The stability of the foreign sulphur market, which has been maintained for several years by marketing agreements between Sicilian producers and American exporters and which has greatly benefited the Sicilian producers, is being threatened by increased production, largely by the Montecatini interests, on the mainland of Italy. Inasmuch as this production is not included in the Sicilian-American marketing agreement and is therefore free to compete in any market, a controversy between the Sicilian Sulphur Consortium and the Montecatini interests has followed. These factions have been unable to effect a compromise; the Italian Government therefore has intervened and appointed a board of arbitration to consider the matter. Meanwhile, the Montecatini Co. intrenched itself more firmly in the European sulphur industry by acquiring substantial refinery capacity in France during 1930.

With an increase of 8 per cent in output the United States continued to be the major factor in the world production of sulphur in 1930. Italy, the second largest producer, also increased its output 8 per cent, while Japan, which ranks third, decreased its output 7 per cent. These three countries produce about 98 per cent of the world's sulphur—the United States about 85 per cent, Italy 11 per cent, and Japan 2 per cent.

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[1] Work on manuscript completed May, 1931.

[2] Figures on domestic production compiled by A. W. Mitchell and those on imports and exports compiled from records of the Bureau of Foreign and Domestic Commerce by J. A. Dorsey, both of the Bureau of Mines.

Spain continued to be the largest factor in the world's pyrites industry, with Norway, Italy, and Japan following in order. Increased activity in the production of pyrites is taking place in the United States, Yugoslavia, and Canada. Processes for the recovery of the sulphur content of pyrites, as sulphurous gases or as elemental sulphur, are being developed in the hope of utilizing more completely the iron and sulphur contained in the pyrites.

In the United States consumption of both sulphur and pyrites was affected by the slowing down of industrial activity, but the percentage of decrease in shipments to domestic consumers was less than the percentage of decrease in exports. In the sulphur industry the year was characterized by record production, decreased shipments, increased stocks, and a steadily maintained price. Exploration by geophysical methods and by drilling in the Gulf coast region was continued, although the amount of exploration by geophysical methods was less than in immediately preceding years.

A statistical summary of the industry in the United States follows: Compared with 1929 the production of sulphur increased 8 per cent to 2,558,981 long tons in 1930, a record output. Shipments of sulphur totaled 1,989,917 tons, or 18 per cent less than in 1929. Exports of crude sulphur in 1930 decreased to 593,312 long tons, a quantity equivalent to about 43 per cent of the shipments for domestic use. Imports of "sulphur and sulphur ore" were negligible. The production of pyrites amounted to 347,512 long tons, an increase of 4 per cent over 1929; total imports amounted to 368,114 long tons, a decrease of 28 per cent. Exports of pyrites, the first for some time, amounted to 15,391 long tons, as reported by the exporting company; exports of pyrites are not separately classified by the Bureau of Foreign and Domestic Commerce. Sulphur consumption decreased in the United States.

SULPHUR

DOMESTIC PRODUCTION

The production of sulphur in the United States reached a new high record in 1930, when 2,558,981 long tons were produced. This output represents an increase of 196,592 tons, or 8 per cent, over the former record total of 2,362,389 tons in 1929. The gain was due to increased output from the new plant of the Texas Gulf Sulphur Co. at Boling Dome and to the opening up of the new property of the same company at Long Point, Fort Bend County, Tex. Shipments, however, decreased from the record total of 2,437,238 tons, valued at $43,800,000, in 1929 to 1,989,917 tons, valued at $35,800,000, in 1930, a decline of 18 per cent in both quantity and value. The large decrease in shipments was due to lessened demand from both domestic and foreign consumers, the larger reduction being in demand from consumers abroad.

The high rate of production and declining shipments in 1930 increased producers' stocks at the mines from 1,928,000 tons at the beginning of the year to 2,497,000 tons at the end of December, a net gain of 569,000 tons.

The average quoted price for sulphur reported by the trade journals was unchanged at $18 a ton f. o. b. mines throughout the year. Open prices were $1 to $3 a ton higher, and prices for sulphur exported were given as $22 a ton f. a. s. Atlantic ports.

The following table shows the progress of American sulphur production from 1911 to 1930:

Sulphur produced and shipped in the United States, 1911–1930

Year	Produced (long tons)	Shipped		Year	Produced (long tons)	Shipped	
		Long tons	Approximate value			Long tons	Approximate value
1911	205, 066	253, 795	$4, 573, 000	1921	1, 879, 150	954, 344	$17, 000, 000
1912	787, 735	305, 390	5, 289, 000	1922	1, 830, 942	1, 343, 624	22, 000, 000
1913	491, 080	319, 333	5, 617, 000	1923	2, 036, 097	1, 618, 841	26, 000, 000
1914	417, 690	341, 985	6, 214, 000	1924	1, 220, 561	1, 537, 345	25, 000, 000
1915	520, 582	293, 803	4, 959, 000	1925	1, 409, 262	1, 858, 003	29, 000, 000
1916	649, 683	766, 835	12, 246, 000	1926	1, 890, 027	2, 072, 657	37, 300, 000
1917	1, 134, 412	1, 120, 378	23, 987, 000	1927	2, 111, 618	2, 072, 109	38, 300, 000
1918	1, 353, 525	1, 266, 709	27, 868, 000	1928	1, 981, 873	2, 082, 924	37, 500, 000
1919	1, 190, 575	678, 257	10, 252, 000	1929	2, 362, 389	2, 437, 238	43, 800, 000
1920	1, 255, 249	1, 517, 625	30, 000, 000	1930	2, 558, 981	1, 989, 917	35, 800, 000

All of the sulphur reported herein as produced in the United States in 1930 came from Texas. The production in 1930 of a total of 120 tons of sulphur ore containing 20 to 85 per cent of sulphur was reported by two producers in Colorado and one in California; however, this material is not included in the sulphur-production figures for the United States.

The sulphur mines operating in the United States in 1930 are listed in the following table:

Sulphur mines operating in the United States in 1930

Operating company	Name of mine	Location of mine
Texas Gulf Sulphur Co	Long Point Dome	Long Point, Fort Bend County, Tex.
Do	Big Hill Dome	Gulf, Matagorda County, Tex.
Do	Boling Dome	Newgulf, Wharton County, Tex.
Freeport Sulphur Co	Bryan Mound	Freeport, Brazoria County, Tex.
Do	Hoskins Mound	Do.
Duval Texas Sulphur Co	Palangana Dome	Benavides, Duval County, Tex.

During 1930, especially in the latter half of the year, there was a noticeable slump in geophysical prospecting in the Gulf coast region due to the depression in the oil industry and to the completion of surveys in the most promising areas. As it is generally considered that all the domes at shallow depths have been found most of the prospecting in the last few years has been concentrated on the detection of domes at great depths. If these deep-seated domes contain sulphur it is questionable whether the sulphur could be mined profitably under present conditions. Despite the decrease in prospecting 15 new geophysical prospects were reported in 1930; so far none of these has been proved up as a dome. Three geophysical prospects discovered in previous years were definitely proved as salt domes by drilling done during 1930.

TEXAS

The production of sulphur by companies in Texas during 1930, compiled on a quarterly basis, is shown in the following table. The table is based on a report issued by the Texas State Comptroller's office.

Sulphur produced in Texas in 1930, by companies, in long tons

Company	First quarter	Second quarter	Third quarter	Fourth quarter	Total
Texas Gulf Sulphur Co	386, 254	490, 930	404, 284	455, 584	1, 737, 052
Freeport Sulphur Co	187, 845	209, 790	173, 120	211, 825	782, 580
Duval Texas Sulphur Co	6, 429	11, 246	10, 180	10, 710	38, 565
	580, 528	711, 966	587, 584	678, 119	2, 558, 197

During 1930 Texas placed a tax of 55 cents per ton on sulphur mined in the State; this replaced the former tax of 2 per cent on gross receipts of sulphur producers.

Texas Gulf Sulphur Co.—The plant of the Texas Gulf Sulphur Co. at Gulf, Tex., continued to produce in 1930 as in previous years. The new plant at Newgulf, Tex., which started to produce during 1929, showed substantial increase during 1930; shipments were begun in August, 1930. During the year the water-heating capacity was increased to about 7,000,000 gallons per day, or double that of the initial installation. The original plant was designed with this expansion in view. The newly installed equipment consists of five 1,500-hp. boilers, a 330-foot radial brick stack 18 feet in diameter, two 70,000-gallon-per-hour low-pressure water-heating tanks with filters and chemical feeding equipment, two high-pressure mine-water heaters, and necessary pumps including three additional pumps for the chemical-treating plant.

Production at Long Point Dome was started in March, 1930, but on a much smaller scale than that at the other two operations of this company. The installed boiler capacity is rated at 1,800 hp. No shipments were made from this property during 1930.

Freeport Sulphur Co.—The Freeport Sulphur Co. produced sulphur at Bryan Mound and at Hoskins Mound in 1930. The production from these two properties for the past five years is shown in the following table:[3]

Sulphur produced by Freeport Sulphur Co., 1926–1930, in long tons

	1926	1927	1928	1929	1930
Bryan Mound	288, 780	292, 280	343, 960	339, 540	211, 900
Hoskins Mound	295, 440	498, 035	564, 010	570, 930	570, 680
	584, 220	790, 315	907, 970	910, 470	782, 580

It will be noted that the total production in 1930 fell below the annual total for the previous three years, due to the decreased rate of production at Bryan Mound; at Hoskins Mound, however, the production was only slightly under the record production of 1929. During the latter part of the year improvements were made at the

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[3] Freeport Texas Co. and subsidiary companies, 1930 Ann. Rept. to Stockholders: 1931, p. 8.

Hoskins Mound plant which increased its water-heating capacity from 4,800,000 to 6,250,000 gallons per day, or approximately 30 per cent. The improvements include methods of treating the water supply, the use of flue gases for preheating feed water, and other alterations to the boiler plant and existing equipment.

This company is on the alert for new prospects of sulphur-bearing domes and is making every effort to acquire new properties; a program of prospecting and development was carried on during 1930. A lease was obtained from the Shell Petroleum Corporation on a dome at Black Bayou in Cameron Parish, La., 8 miles southeast of Orange, Tex. According to the company's annual report for 1930, five wells had been drilled and two were being drilled at the end of the year. One well showed 5 feet of approximately 20 per cent sulphur, and another showed 73 feet of 2 to 10 per cent sulphur. The depth of the cap rock ranges from 900 to 1,500 feet from the apex to the flanks. Sulphur had previously been encountered at widely scattered locations in the course of oil drilling by the Shell Petroleum Corporation in this area. Leases were also secured by the Freeport Sulphur Co. on the Humble Salt Dome in Harris County, Tex., after an independent operator had found sulphur while drilling for oil. Thirteen wells were drilled to completion on this property, and although sulphur was found in a majority of the wells the values were too low to be of commercial interest and the property was abandoned. Leases were also acquired on 2,000 acres on Stratton Ridge, one of the largest salt domes in the Gulf coast region, about midway between Bryan Mound and Hoskins Mound. Six test wells were drilled, but the absence of an appreciable thickness of limestone and the very slight sulphur occurrences eliminated this dome as a commercial deposit.

Data issued by the Freeport Texas Co., the holding company, indicate that the sulphur reserves at the beginning of the year were 1,256,779 long tons at Bryan Mound and 11,500,000 tons at Hoskins Mound.

Duval Texas Sulphur Co.—During 1930 production at Palangana Dome by the Duval Texas Sulphur Co. was at about the same rate as in 1929.

LOUISIANA

Prospecting continued at the Jefferson Island Salt Dome in Iberia Parish. The dome is owned by the Jefferson Lake Oil Co., which discovered sulphur in 1929. The American Cyanamid Co. has the dome under contract and is drilling a number of tests to determine the extent and character of the sulphur formations. The Freeport Sulphur Co. is prospecting a dome structure in Cameron Parish (see above).

MISSISSIPPI

Activity in sulphur prospecting and development was reported in the southern counties adjacent to the Gulf coast during the year.

NEVADA

No production of sulphur was reported from Nevada in 1930. The assets of the Humboldt Sulphur Co., which produced from a deposit at Sulphur, Nev., for several years, have been turned over to the Sierra Sulphur Corporation (Ltd.), a Nevada corporation, which will be the operating company.

UTAH

No production of sulphur was reported from Utah in 1930. During the year the Utah Sulphur Industries, at Sulphurdale, Utah, was reported as making additions to its plant. A new retort system which has been designed and installed may double the previous plant capacity.

COLORADO

A small quantity of sulphur-bearing material was produced by the P. T. & S. Chemical Co. and the San Juan Sulphur & Chemical Co. (Inc.), near Hotchkiss, Delta County. This material was probably used in the manufacture of fertilizer.

CALIFORNIA

A small quantity of sulphur-bearing material was produced by the Growers Chemical Co. (Ltd.), from the Elgin mine near Williams, Colusa County. This material was used as a dusting insecticide.

BY-PRODUCT SULPHUR

A large quantity of sulphur is recovered each year as a by-product from copper and zinc mining operations and from the manufacture of fuel gas. This sulphur is largely recovered in the form of sulphuric acid and is not included in the sulphur-production figures for the United States.

The concentration of some copper and zinc ores yields, in addition to copper and zinc concentrates, a pyrites concentrate which is an important source of sulphur. The production of this commodity is discussed under the pyrites section of this report. In the smelting of copper and zinc concentrates the sulphur content is driven off in the form of sulphur dioxide gas, which is used in the manufacture of sulphuric acid at many smelters. Approximately 220,000 tons of sulphur has been recovered annually during the past five years.

During the past several years processes for the recovery of sulphur from a slurry that results from the purification of manufactured fuel gases have been developed in the United States. The slurry contains very finely divided sulphur which may be recovered by steam distillation, or the slurry itself may be used directly as an insecticide after washing to remove certain objectionable chemicals. A canvass of the various producers of slurry indicates an annual production of 2,500 long tons of sulphur in this type of material. Only part of the material is marketed; the remainder accumulates in dumps at various plants. Before the advent of natural gas in northern California, several thousand tons of this by-product sulphur was produced and used for agricultural purposes.

IMPORTS AND EXPORTS

The imports of sulphur into the United States reached a peak of nearly 189,000 long tons in 1903. With the rapid increase in American production, however, imports have declined and since 1917 have been of little consequence. In 1930, 29 long tons of "sulphur and sulphur ore," valued at $1,523, was imported.

The export business in American sulphur was started in 1904, when a cargo of 3,000 tons was shipped from Louisiana. Since then the increase has been steady, until the annual exports exceed by more than two hundred times the overseas shipments of 1904. During 1930, however, exports decreased to 593,312 tons, a decline of 31 per cent from the record total of 855,183 tons in 1929 and the lowest figure since 1926. The curtailment of American export trade in sulphur in 1930 reflects the depression affecting the chemical industry throughout the world.

The following table shows the crude sulphur imported into and exported from the United States from 1911 to 1930:

Crude sulphur imported into and exported from the United States, 1911–1930

Year	Imports for consumption		Exports		Year	Imports for consumption		Exports	
	Long tons	Value	Long tons	Value		Long tons	Value	Long tons	Value
1911	24, 200	$434, 796	28, 103	$545, 420	1921	4	$226	285, 762	$4, 524, 768
1912	26, 885	494, 778	57, 736	1, 076, 414	1922	[1] 167	6, 453	485, 664	7, 095, 628
1913	15, 122	286, 209	89, 221	1, 599, 761	1923	[2] 465	21, 535	472, 525	7, 105, 260
1914	23, 610	398, 984	98, 163	1, 807, 324	1924	[2] 1, 005	40, 293	482, 114	7, 792, 854
1915	24, 647	405, 990	37, 312	724, 679	1925	[2] 100	4, 411	629, 401	11, 000, 235
1916	21, 289	358, 416	128, 755	2, 505, 857	1926	[2] 48	1, 052	576, 966	10, 918, 394
1917	973	20, 176	152, 736	3, 500, 819	1927	[2] 3, 384	34, 487	789, 274	16, 254, 227
1918	55	1, 692	131, 092	3, 626, 638	1928	[2] 4, 787	21, 320	685, 051	14, 345, 075
1919	77	1, 997	224, 712	6, 325, 552	1929	[2] 1, 163	6, 616	855, 183	17, 628, 813
1920	44	1, 722	477, 450	8, 994, 350	1930	[2] 29	1, 523	593, 312	12, 416, 233

[1] Composed of 130 tons of "crude sulphur," imported Jan. 1 to Sept. 21, and 37 tons of "sulphur and sulphur ore," imported Sept. 22 to Dec. 31.

[2] Classified as "sulphur and sulphur ore."

In addition to brimstone or crude sulphur, the United States exports treated products, such as crushed, ground, refined, and sublimed sulphur and flowers of sulphur. Exports of these commodities in 1930 amounted to 35,870,359 pounds, valued at $556,029, a decrease of 3,694,616 pounds, or 9 per cent, from the total in 1929; the average value in 1930 was 1.55 cents a pound, or about $35 per long ton.

Exports to all the countries that receive important quantities of American crude sulphur showed substantial decreases in 1930, while exports to some of the smaller markets increased. The most notable decrease among the large consumers occurred in shipments to France, which were 56,190 tons in 1930 compared with 136,732 tons in 1929, or a decrease of 59 per cent. During the past decade France has received approximately 100,000 long tons of American crude sulphur per year. Canada was again the largest importer of American crude sulphur, taking 166,943 tons in 1930, or 28 per cent of the total exports, compared with 200,012 tons in 1929; Germany was again second with 120,569 tons, or 20 per cent, compared with 169,474 tons in 1929; Australia ranked third with 65,036 tons, or 11 per cent, compared with 104,538 tons in 1929, and supplanted France, which in 1930 ranked fourth with about 9.5 per cent of the total. These four countries received 69 per cent of the total exports of American brimstone in 1930.

Germany was again the best customer for American treated sulphur, taking 8,535,192 pounds, or 24 per cent of the total exports from the United States. Canada was again second with 7,263,047 pounds, or 20 per cent of the total, and was followed in order by United Kingdom, Russia, Mexico, Uruguay, and Australia.

The following table shows the exports of crude sulphur and treated sulphur from the United States in 1929 and 1930, by countries of destination:

Sulphur exported from the United States, 1929 and 1930, by destinations

Destination	Sulphur or brimstone		Crushed, ground, refined, sublimed, and flowers of	
	Long tons	Value	Pounds	Value
1929				
North America:				
Canada	200,012	$3,676,034	7,818,689	$154,529
Central America	149	4,710	311,606	8,521
Mexico	13,334	278,802	2,330,020	49,351
Newfoundland and Labrador	8,452	158,076	3,323	88
West Indies and Bermuda	4,000	88,000	1,274,341	31,497
	225,947	4,205,622	11,737,979	243,986
South America:				
Argentina	4,200	88,200	1,200	23
Brazil	5,610	124,880	2,205,652	33,150
Colombia			147,121	3,962
Uruguay			1,791,960	23,454
Other	64	1,883	272,218	5,996
	9,874	214,963	4,418,151	66,585
Europe:				
Belgium	3,309	73,320	1,098,419	15,252
Finland	4,353	108,822		
France	136,732	2,892,030	289,200	4,341
Germany	169,474	3,792,254	10,114,889	133,325
Netherlands	50,707	1,133,659	649,787	8,481
Spain	16,475	333,924		
United Kingdom	43,856	945,264	2,889,167	43,150
Other			2,825,306	41,477
	424,906	9,279,273	17,866,768	246,026
Asia	1,950	41,925	1,108,515	16,370
Africa:				
Algeria and Tunisia	6,604	135,378		
Mozambique	10,000	254,500	34,500	514
Other Portuguese Africa	10,416	197,488		
Union of South Africa	23,900	495,700	229,455	3,473
	50,920	1,083,066	263,955	3,987
Oceania:				
Australia	104,538	2,067,125	3,684,423	57,911
French Oceania			600	30
New Zealand	37,048	736,839	484,584	14,345
	141,586	2,803,964	4,169,607	72,286
	855,183	17,628,813	39,564,975	649,240
1930				
North America:				
Canada	166,943	3,028,066	7,263,047	129,726
Central America	15	442	446,070	8,570
Mexico	9,384	200,234	2,042,163	44,087
Newfoundland and Labrador	5,622	106,811		
West Indies and Bermuda	17,480	372,560	296,443	8,127
	199,444	3,708,113	10,047,723	190,510
South America:				
Argentina	7,150	150,150	83,785	1,270
Brazil	1,110	24,080	444,220	7,749
Colombia			74,786	2,333
Uruguay			1,855,100	24,437
Other	90	2,135	328,055	6,062
	8,350	176,365	2,785,946	41,851

Sulphur exported from the United States, 1929 and 1930, by destinations—Contd.

Destination	Sulphur or brimstone		Crushed, ground, refined, sublimed, and flowers of	
	Long tons	Value	Pounds	Value
1930—Continued				
Europe:				
Belgium	5, 164	$121, 461	684, 088	$9, 257
Finland	11, 274	214, 238		
France	56, 190	1, 235, 976	470, 789	6, 794
Germany	120, 569	2, 816, 356	8, 535, 192	111, 482
Netherlands	35, 073	811, 434	987, 879	12, 846
Spain	9, 045	187, 268		
United Kingdom	28, 683	628, 497	3, 527, 776	48, 340
Other	3, 794	72, 097	3, 477, 298	39, 163
	269, 792	6, 087, 327	17, 683, 022	227, 882
Asia	1, 797	38, 420	2, 565, 305	45, 284
Africa:				
Algeria and Tunisia	9, 675	174, 150		
Canary Islands			10, 000	302
Egypt			43, 644	494
Liberia			7, 480	142
Mozambique	7, 264	175, 996	31, 200	472
Union of South Africa	13, 742	297, 134	422, 548	6, 373
	30, 681	647, 280	514, 872	7, 783
Oceania:				
Australia	65, 036	1, 371, 283	1, 672, 241	25, 661
New Zealand	18, 212	387, 445	599, 750	17, 005
Other British			1, 500	53
	83, 248	1, 758, 728	2, 273, 491	42, 719
	593, 312	12, 416, 233	35, 870, 359	556, 029

CONSUMPTION

APPARENT CONSUMPTION OF PRIMARY SULPHUR

The chemical industry, which supplies raw materials for agriculture and almost every industrial activity, experienced a decline in 1930 due to the serious business depression. As the chemical industry is the principal user of sulphur it is not surprising that the dullness of that industry was reflected in the decreased demand for sulphur in 1930. Early in the year the demand was good, but in later months the market was curtailed considerably. The comparatively small decrease in shipments of sulphur to domestic consumers compared with the reported falling off in output in all industries is striking. As sulphur is sold on long-term contracts, it is possible that consumers' stocks increased considerably; however, no figures for stocks are available.

The trend of sulphur consumption in the United States for the last quinquennial period is shown in the following table, in which it is assumed that stocks in consumers' hands are small and constant:

Apparent consumption of sulphur in the United States, 1926–1930, in long tons

	1926	1927	1928	1929	1930
Shipments	2, 072, 657	2, 072, 109	2, 082, 924	2, 437, 238	1, 989, 917
Imports	48	3, 384	4, 787	1, 163	29
	2, 072, 705	2, 075, 493	2, 087, 711	2, 438, 401	1, 989, 946
Exports (crude)	576, 966	789, 274	685, 051	855, 183	593, 312
Exports (refined)	5, 358	14, 026	19, 882	17, 663	16, 014
	582, 324	803, 300	704, 933	872, 846	609, 326
Apparent consumption	1, 490, 381	1, 272, 193	1, 382, 778	1, 565, 555	1, 380, 620

CONSUMPTION, BY USES

The use of sulphur in the various domestic industries has been estimated for 1928, 1929, and 1930 by Chemical and Metallurgical Engineering, as follows:

Sulphur consumed in the United States, 1928–1930, by uses, in long tons

Use	1928	1929	1930
Heavy chemicals	520,000	560,000	471,000
Fertilizer and insecticides	345,000	415,000	418,000
Pulp and paper	250,000	265,000	235,000
Explosives	60,000	67,000	48,000
Dyes and coal-tar products	42,000	47,000	41,000
Rubber	40,000	43,000	31,000
Electrochemicals	21,000	23,000	20,000
Fine chemicals	14,000	15,000	13,000
Paint and varnish	5,000	5,000	4,500
Food products	5,000	5,000	4,500
Petroleum products	1,000		
Miscellaneous	123,000	136,700	110,600
	1,426,000	1,581,700	1,396,600

SULPHURIC ACID

The production of sulphuric acid, the chief use of sulphur in the United States, decreased in 1930, although not as severely as that of many other commodities. The following table, which shows the consumption of sulphuric acid by industries in 1928, 1929, and 1930, is largely based upon estimates by Chemical and Metallurgical Engineering. The figures on acid consumed in the fertilizer industry are those given by the Bureau of the Census.

Sulphuric acid (expressed as 50° B.) consumed in the United States, 1928–1930, by industries, in short tons [1]

Industry	1928	1929	1930
Fertilizer [2]	2,434,000	2,418,000	2,448,000
Petroleum refining	1,350,000	1,570,000	1,485,000
Chemicals	745,000	890,000	820,000
Coal products	740,000	935,000	800,000
Iron and steel	670,000	800,000	660,000
Other metallurgical	570,000	675,000	560,000
Paints and pigments	205,000	225,000	200,000
Explosives	170,000	195,000	177,000
Rayon	105,000	150,000	145,000
Textiles	78,000	90,000	78,000
Miscellaneous	292,000	390,000	350,000
	7,359,000	8,338,000	7,723,000

[1] Figures, except those for the fertilizer industry, based upon estimates by Chemical and Metallurgical Engineering.

[2] Bureau of the Census, Department of Commerce.

Figures for the production of sulphuric acid as a by-product at smelting plants in 1928, 1929, and 1930 follow. The table gives the output at both copper and zinc plants, which constitutes practically all of the by-product acid produced in the United States. The figures also include the sulphuric acid made from the pyrites concentrates in Tennessee and Wisconsin.

By-product sulphuric acid (expressed as 60° B.) produced at copper and zinc plants in the United States, 1928–1930, in short tons

	1928	1929	1930
Copper plants	[1] 603, 100	[1] 633, 438	651, 702
Zinc plants	558, 537	627, 018	536, 614
	[1] 1, 161, 637	[1] 1, 260, 456	1, 188, 316

[1] Revised figures.

WORLD PRODUCTION

The world production of sulphur in 1930 is estimated as slightly more than 3,000,000 long tons. The following table shows the production of sulphur by the principal producing countries during the past decade:

Production of sulphur in the principal producing countries, 1921–1930, in long tons

Year	United States (sulphur)	Italy		Japan		Chile (sulphur)	Spain (sulphur)
		Sulphur	Ore	Sulphur	Ore		
1921	1, 879, 150	269, 547	28, 405	36, 013	30, 147	9, 517	5, 170
1922	1, 830, 942	164, 696	22, 347	34, 095	41, 424	12, 057	13, 028
1923	2, 036, 097	252, 293	9, 316	36, 825	35, 749	11, 200	8, 382
1924	1, 220, 561	290, 241	21, 948	46, 133	50, 892	9, 611	9, 388
1925	1, 409, 262	259, 428	26, 821	46, 962	42, 620	8, 929	7, 859
1926	1, 890, 027	267, 107	33, 088	47, 020	46, 545	8, 787	9, 351
1927	2, 111, 618	300, 888	23, 487	60, 371	16, 505	12, 303	10, 065
1928	1, 981, 873	291, 430	31, 051	68, 956	13, 109	15, 423	10, 199
1929	2, 362, 389	318, 722	21, 149	64, 430	14, 849	[1] 16, 000	11, 715
1930	2, 558, 981	[2] 343, 834	[2] 22, 400	[1] 60, 000	([3])	[1] 16, 000	[1] 10, 000

[1] Estimated. [2] Official preliminary estimate. [3] Data not available.

ITALY

The production of sulphur in Italy in 1930 amounted to 343,834 long tons, the greatest output since 1915 and an increase of 25,112 tons, or 8 per cent, over the output of 318,722 tons in 1929. Increased production was made from mines both in Sicily and on the Continent.

Sicily, the chief source of sulphur besides the Gulf coast region of the United States, produced 246,814 long tons in 1930, compared with 237,945 tons in 1929, an increase of 4 per cent. The Sicilian Sulphur Consortium attributed the increase in production to the improvement in extraction methods made possible by the credits extended through the Banco Sicilia and to the eagerness of operators to extract as much sulphur as possible before the expiration of mining rights and the application of the new subsoil laws. The increase in production was largely in the third and fourth grades, the output of the "yellow superior" or first grade having actually declined. The electrification of the sulphur mines progressed throughout the year, although some of the mine owners refused to have their properties electrified, preferring, in view of the low cost of labor and the high cost of electric power, the primitive methods of mining and transportation that have existed in Sicily for centuries; however, it is planned to complete the electrification of the Sicilian sulphur mines in 1931 or 1932. Wages have been greatly reduced in this industry and at the end of the year amounted to 12 lire per day.

The Sicilian sulphur industry is faced by a large overproduction; stocks of sulphur increased 100 per cent during the last six months of 1930 and amounted to more than 100,000 tons at the end of the year. The principal factors contributing to this condition were as follows: (1) Increased production in Sicily; (2) decreased demand due to world-wide business slump; (3) limited exports based upon agreement with United States producers; and (4) increased production in continental Italy, largely by the Montecatini interests.

An event of outstanding importance to the sulphur industry in 1930 was the action of the Italian Government in extending the life of the consortium of Sicilian sulphur producers from July 31, 1930, until 1940, and in returning the management of the consortium to private agencies. Owing to the financial difficulties of the old consortium, Government management by a board of royal commissioners was established by law in June, 1922. Under the law of 1930 the management is returned to a board of directors selected by the members. Membership in the consortium is practically compulsory for all sulphur producers of Sicily, as a special fine is assessed upon all Sicilian sulphur produced by nonmembers. Both the consortium and the members are exempt from all ordinary taxes and imposts, including import duties upon goods purchased abroad for use in the industry. A tax is paid on the amount of sulphur produced. The 1930 law extends, to July 31, 1934, the regulation set forth in the royal decree of August 5, 1927, whereby royalties in kind or in money payable to the concessionnaires and subconcessionnaires of the Sicilian sulphur mines were reduced by 33 per cent. An autonomous technical mining organization is constituted under the new law to promote and facilitate improved technique in mining and working the ore and to organize and conduct research work and surveys for new sulphur deposits in Sicily.

The sulphur mines of continental Italy are assuming greater importance and in the past few years have practically doubled their production. The output of these mines, virtually all held by the Montecatini interests, amounted to 97,000 long tons in 1930, compared with 92,000 tons in 1929, an increase of 5 per cent. The output comes mainly from the Marches and Romagna. As mainland production is not included in the agreement between the Sicilian and American sulphur producers it has been exported to the disadvantage of the Sicilian producers. This has led to a controversy between the Sicilian Sulphur Consortium and the Montecatini Co., and as these factions have been unable to effect a compromise the Italian Government has intervened and appointed a board of arbitration to consider the matter. Meanwhile, during 1930, the Montecatini Co. acquired substantial refinery capacity in France through the Société Continentale des Raffineries de Soufre and is considering an increase in its production of refined sulphur in France and other countries. The production of refined sulphur in France is estimated at 150,000 to 200,000 tons annually.

The exports of sulphur from Italy increased from 215,306 long tons in 1929 to 237,412 tons in 1930, or 10 per cent, following a 14 per cent increase in the 1929 exports over those in 1928. A table showing the quantity and destination of the consignments in 1929 and 1930 follows:

Sulphur exported from Italy, 1929 and 1930, by destinations, in long tons

Destination	1929	1930	Destination	1929	1930
Europe:			Africa:		
Austria	13,627	11,846	Algeria	4,331	98
Belgium	2,901	3,518	British South Africa	637	4,199
France	34,775	33,520	Egypt	1,545	1,986
Germany	4,919	8,063	Tunisia	1,720	3,796
Greece	8,418	8,586	Asia:		
Hungary	531	1,138	British India	13,879	16,218
Netherlands	123	697	Netherland East Indies	15,033	12,255
Portugal	7,784	8,814	Turkey in Asia	2,982	1,861
Rumania	1,601	2,556	South America:		
Spain	3,135	7,942	Argentina	6,295	4,356
Sweden	17,433	14,055	Brazil	1,207	1,589
Switzerland	1,176	1,761	Uruguay	1,439	1,238
Turkey in Europe	308	212	Australia	448	13,948
Union of Socialist Soviet Republics	16,846	11,106	Other countries	12,948	18,238
United Kingdom	37,217	42,112		215,306	237,412
Yugoslavia	2,048	1,704			

JAPAN

It is estimated that Japan produced 60,000 long tons of sulphur in 1930, a decrease of 7 per cent from the output in 1929. Most of the Japanese sulphur comes from the island of Hokkaido and is used in Japan, but small amounts go to near-by China and to Hong Kong.

CHILE

The production of sulphur in Chile is estimated at 16,000 tons in 1930, largely from the deposits in Tacna and Antofagasta. Enormous deposits of sulphur occur at high altitudes in the volcanic regions of Chile, but their development is retarded by the rigors of climate and hardships of working at altitudes of 5,000 meters. Most of the Chilean sulphur is used in the nitrate industry, which was curtailed greatly during 1930 owing to the closing of a number of plants. Sulphur is also used in the vineyards and on the sheep ranches.

Late in 1930 the Tigon Mining & Finance Corporation (Ltd.), of London, through the Cia-Azufrera y Minera del Pacifico, S. A., acquired control of sulphur mines and sulphur-bearing lands on Mounts Tacora and Chupiquina, adjacent to the Arica-La Paz Railway in the extreme northern part of Chile. The company's engineers estimate that the properties contain about 11,000,000 tons of proven ore of 60 to 80 per cent sulphur content, besides about 7,500,000 tons of probable ore of approximately the same tenor. The properties acquired have been producing about 9,000 tons of refined sulphur annually. The work is done by Bolivian and Peruvian Indians, who are accustomed to life in high altitudes.

OTHER COUNTRIES

Spain's output of sulphur, which is estimated at 10,000 tons in 1930, is insufficient for its own requirements. A large percentage of the sulphur mined in Spain comes from the Provinces of Teruel and Albacete. The Tigon Mining & Finance Corporation (Ltd.) is developing a new method of extracting sulphur from ores which it mines in the Province of Almeria.

Native sulphur is also mined in Greece, where about 2,000 tons is obtained annually; practically all of this comes from the volcanic island of Melos.

Small quantities of sulphur are produced in New Zealand, Russia, China, and Netherland East Indies.

PYRITES

DOMESTIC PRODUCTION

The production of pyrites (ore and concentrates) amounted to 347,512 long tons in 1930 compared with 333,465 tons in 1929, an increase of 4 per cent. The output in 1930 exceeds in quantity that in any year since 1919. The above figures include pyrite and pyrrhotite concentrates from copper operations in Tennessee and pyrite concentrates from zinc operations in New York and Wisconsin. Figures in earlier reports of this series did not include the concentrates from copper operations in Tennessee or zinc operations in Wisconsin. The following tables give the production of pyrites (ore and concentrates) in the United States during the past 20 years:

Pyrites produced in the United States, 1911–1930

Year	Long tons	Value	Year	Long tons	Value
1911	301, 458	$1, 164, 871	1921	157, 118	$711, 432
1912	350, 928	1, 334, 259	1922 [1]	169, 043	671, 241
1913	341, 338	1, 286. 084	1923 [1]	181, 628	661, 000
1914	336, 662	1, 283, 346	1924 [1]	160, 096	645, 262
1915	394, 124	1, 674. 933	1925 [1]	170, 081	650, 448
1916	439, 132	2, 038, 002	1926 [1]	166. 559	616, 668
1917	482, 662	2, 593, 035	1927 [1]	215, 786	804, 006
1918	464, 494	2, 644, 515	1928 [1]	312, 815	1, 081, 758
1919	420, 647	2, 558, 172	1929 [1]	333, 465	1, 250, 141
1920	310, 777	1, 596, 961	1930 [1]	347, 512	1, 028, 680

[1] Figures for 1928 to 1930, inclusive, include by-product pyrites from zinc operations in Wisconsin and New York and pyrite and pyrrhotite concentrates from copper operations in Tennessee. Similar output for Wisconsin and Tennessee in earlier years (1922 to 1927) was not included in the statistics. The production of pyrite and pyrrhotite concentrates in Tennessee began in 1925.

The production of by-product pyrites from zinc operations in Wisconsin and of pyrite and pyrrhotite concentrates from copper operations in Tennessee, 1922 to 1927, not included in the preceding table, was as follows:

	Long tons		Long tons
1922	3, 808	1925	23, 561
1923	9, 007	1926	60, 374
1924	7, 818	1927	87, 040

The pyrites produced in 1930 contained approximately 124,226 long tons of sulphur, compared with 120,371 tons in 1929. The quantity of pyrites (ore or concentrates) sold or consumed by the producing companies totaled 350,177 tons in 1930, compared with 336,456 tons in 1929.

In 1930, as in preceding years, pyrites was produced in California, Tennessee, Virginia, and Wisconsin. Production of pyrites concentrates in 1930 was also reported from New York, from which no output had been reported since 1926. Tennessee was again the largest producer, the output coming from the mines of the Tennessee Copper Co. and the Ducktown Chemical & Iron Co. in the Ducktown Basin, Polk County.

TENNESSEE

The Tennessee Copper Co., a subsidiary of the Tennessee Corporation, operated the Burra Burra and the Eureka mines in 1930 and was also engaged in unwatering and developing the Polk County mine, which has been idle since 1920. The Burra Burra mine is much the largest operation and is the chief source of the ore smelted and treated in the company's smelter and acid plant at Copperhill. This mine operates steadily and furnishes a regular output of 40,000 tons of ore per month. The Eureka mine is operated irregularly and produces a much smaller tonnage of high-sulphur ore, the rate of output depending upon the demand for sulphur in making acid. The methods of mining at these properties are described by McNaughton.[4] The pyrite and pyrrhotite are recovered in the mill by selective flotation; the mill also makes copper and zinc concentrates.

The Ducktown Chemical & Iron Co. operates the Mary and the Isabella mines, but the only pyrites produced comes from the mill at the Isabella mine where pyrite concentrates and pyrrhotite concentrates are made by selective flotation. In the operation of the mill the chalcopyrite is floated off first, then the pyrite, and lastly the pyrrhotite. Iron concentrates (magnetic) of a third type are made with a Dings magnetic separator. The three types of iron concentrates are then mixed and sent to the roasters. Kegler[5] has described the method of mining.

VIRGINIA

The only pyrites production from Virginia in 1930 came from the Gossan mine at Cliffview, Carroll County. The mine, which produced both lump and fines, was operated by the General Chemical Co.

CALIFORNIA

The companies producing pyrites in California in 1930 were the Leona Chemical Co. in Alameda County and the Mountain Copper Co. (Ltd.) in Shasta County.

The Leona Heights mine, operated by the Leona Chemical Co., is about 4 miles southeast of Oakland, Alameda County, and has had a continuous record of production since 1912. A new section of the mine was opened up by adit in 1926; all ore is now coming from this section, which is 25 feet thick and underlies 60 to 80 feet of overburden. The pyrites averages about 47 per cent sulphur; it carries \$1 to \$2 per ton in gold and approximately 1 per cent copper, but the metal values are not recovered. The sulphur content is used by the Stauffer Chemical Co.

Early in the third quarter of 1930 the Mountain Copper Co. (Ltd.) resumed the production of pyrites from the Hornet mine, which was shut down late in 1929 owing to competition from pyrites imported into San Francisco from the Britannia Mining & Smelting Co., of British Columbia. The mine produced about 225 tons daily, and regular shipments were made to firms in the bay region engaged in the manufacture of chemicals and fertilizers.

NEW YORK

During 1930 the St. Joseph Lead Co. produced 15,474 long tons of pyrites concentrates at its Balmat mine. The pyrites was produced as a flotation concentrate in the treatment of ore in which zinc is the principal value.

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[4] McNaughton, C. H., Mining Methods of the Tennessee Copper Co., Ducktown, Tenn.: Inf. Circ. 6149, Bureau of Mines, June, 1929, pp. 1-18.

[5] Kegler, V. L., Mining Methods of the Ducktown Chemical & Iron Co., Mary Mine, Isabella, Tenn.: Inf. Circ. 6397, Bureau of Mines, February, 1931. pp. 1-9.

WISCONSIN

The only company reporting pyrites production in Wisconsin in 1930 was the National Zinc Separating Co., which is making a pyrite concentrate at its magnetic separating plant at Cuba City from raw zinc concentrates obtained from several mines in the Platteville district. The ore is mined by the system used in southeast Missouri and Joplin and contains principally sphalerite, pyrite, and galena. The zinc-pyrite concentrates from the mills are brought together at the roasting plant. A preliminary roast renders the iron sulphides magnetic, and after the calcines are cooled magnetic concentrates are made with a rotating magnetic disk and then given a dead roast to remove the sulphur. The gases from the preliminary and dead roasts are used in the manufacture of sulphuric acid.

IMPORTS AND EXPORTS

The "general" imports of pyrites amounted to 368,114 long tons, valued at $1,037,017, in 1930, compared with 514,336 tons, valued at $1,507,648, in 1929, a decrease of 28 per cent in quantity and 31 per cent in value.

The trend in the imports of pyrites from 1911 to 1930 is shown in the following table:

Sulphur ore as pyrites, containing more than 25 per cent of sulphur, imported for consumption in the United States, 1911–1930

Year	Long tons	Value	Year	Long tons	Value
1911	1,006,310	$3,788,803	1921	216,229	$818,852
1912	970,785	3,841,683	1922	279,445	1,199,076
1913	850,592	3,611,137	1923	263,695	1,254,389
1914	1,026,617	4,797,326	1924	246,737	598,544
1915	964,634	4,817,977	1925	276,385	773,925
1916	1,244,662	6,728,318	1926	366,151	856,981
1917	967,340	5,981,457	1927	250,794	647,512
1918	496,792	2,741,676	1928	457,123	1,135,463
1919	388,973	2,176,565	1929	514,336	1,507,648
1920	332,606	1,660,832	1930	354,543	1,009,081

Of the total pyrites imported in 1930 Spain furnished 325,992 long tons, or 89 per cent, and Canada 42,117 tons, or 11 per cent. The countries from which pyrites has been imported since 1926 are shown in the following table:

Sulphur ore as pyrites, containing more than 25 per cent of sulphur, imported into the United States, 1926–1930, by sources

[General imports]

Country	1926		1927		1928		1929		1930	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
Canada	1,046	$2,191	9,203	$30,992	56,956	$192,864	68,243	$240,411	42,117	$145,645
Norway					7,468	15,611				
Soviet Russia in Europe									5	20
Spain	365,105	854,790	241,591	616,520	393,840	932,261	446,093	1,267,237	325,992	891,352
	366,151	856,981	250,794	647,512	458,264	1,140,736	514,336	1,507,648	368,114	1,037,017

Imports from Spain constitute the major part of the American trade in this commodity, owing to the occurrence of large, cheaply mined deposits of pyrites of an unusual grade near the coast of Spain (Huelva district) and to the comparatively low ocean transportation rates between Huelva and the Atlantic seaboard of the United States Such imports, however, showed a large decrease in 1930 because of the general industrial depression.

Imports from Canada decreased 38 per cent in 1930, following a large increase in each of the two preceding years. The decrease in 1930 was due largely to the curtailing of exports from Canada to consuming industries in the San Francisco Bay region. Approximately one-third of the imports from Canada entered Washington, where the pyrites was probably used at the Tacoma smelter for fluxing.

Considering the recoverable sulphur content of the imported pyrites as 45 per cent, the quantity of sulphur available in imported pyrites in 1930 was 165,651 long tons.

Exports of pyrites are not separately classified by the Bureau of Foreign and Domestic Commerce. An exporting company reports that during 1930 the United States exported 15,391 long tons of pyrites.

WORLD PRODUCTION

The following table shows the world production of pyrites and the quantity of sulphur it is supposed to replace in the market. Most of the figures are taken from the official sources of the countries concerned, supplemented by information taken from the publications of the Imperial Institute and other reliable sources:

World production of iron pyrites (including cupreous pyrite), 1926–1930, in metric tons

[Compiled by M. T. Latus, of the Bureau of Mines]

Country[1]	1926	1927	1928	1929	1930
Algeria:					
Gross weight	11,505	12,918	13,825	16,804	16,628
Sulphur content	5,386	6,071	6,498	7,730	7,483
Austria:					
Gross weight	22,293	19,328	10,000	------------	(2)
Sulphur content	5,137	3,153	2,000	------------	(2)
Canada:					
Gross weight	16,189	46,142	62,447	70,087	48,619
Sulphur content	8,142	22,887	[3] 35,007	[3] 39,949	25,163
Cyprus: [4]					
Gross weight	152,776	211,462	243,913	295,772	242,316
Sulphur content	76,387	105,731	121,956	147,886	121,158
Czechoslovakia:					
Gross weight	22,512	23,300	23,626	23,005	(2)
Sulphur content	9,005	9,203	9,332	9,087	(2)
France:					
Gross weight	192,340	208,400	202,084	194,400	(2)
Sulphur content	90,748	94,430	(2)	(2)	(2)
Germany:					
Gross weight	237,870	350,430	342,179	351,909	(2)
Sulphur content	98,939	149,531	145,866	149,983	(2)
Greece:					
Gross weight	81,000	100,050	94,270	134,399	163,000
Sulphur content	39,577	48,884	45,360	64,434	(2)
Hungary:					
Gross weight	176	3,666	4,222	1,023	1,069
Sulphur content	(2)	(2)	(2)	(2)	(2)

[1] In addition to the countries listed British India reports a production in 1929 of 299 metric tons obtained in the course of prospecting operations; sulphur content not stated.

[2] Data not available.

[3] Includes estimated quantity of sulphur in smelter gases used for acid making.

[4] Exports.

World production of iron pyrites (including cupreous pyrite), 1926–1930, in metric tons—Continued

Country	1926	1927	1928	1929	1930
Italy:					
Gross weight	594,479	625,338	558,390	664,543	713,500
Sulphur content	273,248	286,227	256,683	305,847	(2)
Japan:					
Gross weight	417,513	506,089	593,972	618,743	(2)
Sulphur content	(2)	(2)	(2)	(2)	(2)
Norway:					
Gross weight	634,836	617,044	738,535	739,597	(2)
Sulphur content	272,330	266,855	321,630	323,844	(2)
Poland:					
Gross weight	18,850	24,596	10,668	9,410	11,046
Sulphur content	(2)	(2)	(2)	(2)	4,860
Portugal:					
Gross weight	210,487	301,035	242,122	384,350	(2)
Sulphur content	(2)	(2)	(2)	(2)	(2)
Rumania:					
Gross weight	42,039	25,514	23,715	23,851	(2)
Sulphur content	(2)	(2)	(2)	(2)	(2)
Russia: [5]					
Gross weight	109,394	225,318	152,041	(2)	(2)
Sulphur content	(2)	(2)	(2)	(2)	(2)
Spain:					
Gross weight	3,654,789	3,610,694	3,624,819	3,867,250	(2)
Sulphur content	1,658,391	1,609,776	1,439,747	1,496,756	(2)
Sweden:					
Gross weight	69,759	69,239	19,996	72,055	(2)
Sulphur content	27,073	32,126	12,394	32,082	(2)
Union of South Africa:					
Gross weight	2,448	2,254	3,754	4,116	3,603
Sulphur content	(2)	(2)	(2)	(2)	(2)
United Kingdom:					
Gross weight	4,307	4,968	4,440	4,441	5,585
Sulphur content	(2)	(2)	(2)	(2)	(2)
United States:					
Gross weight	[6] 169,232	[6] 219,249	317,836	338,817	353,090
Sulphur content	67,502	84,909	115,124	122,303	126,220
Yugoslavia:					
Gross weight	53,376	57,003	64,273	61,153	50,345
Sulphur content	(2)	(2)	(2)	(2)	(2)

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[2] Data not available.

[5] Year ended Sept. 30.

[6] Exclusive of by-product pyrites from zinc operations in Wisconsin and of pyrite and pyrrhotite concentrates from copper operations in Tennessee.

SPAIN

Although the official statistics are not yet available it is believed that the Spanish production of both iron and copper pyrites was decidedly less in 1930 than in 1929, especially as the final months of the year showed important decreases in output. The effect of the declining prices of copper and pyrites was offset to some extent by depreciation of the peseta.

NORWAY

The 1930 production of pyrites in Norway is estimated at 720,000 metric tons, a decrease of 3 per cent from 1929. This decline is due to the closing of the Foldal and, more recently, of the Kjoli mine. The Orkla Grubeaktiebolag is the largest producer of Norwegian pyrites and is building a plant near Trondhjem to exploit the "Orkla Metoden" for the production of sulphur from pyrites.

ITALY

According to preliminary official figures the production of pyrites in Italy in 1930 amounted to 713,500 metric tons, an increase of 7 per cent over the 664,543 tons produced in the previous year. The Montecatini Co. is by far the largest producer in Italy.

GREECE

The production of pyrites in Greece during 1930, according to estimates by the Mine Inspection Bureau of Macedonia, amounted to 163,000 metric tons compared with approximately 134,000 tons in 1929, an increase of nearly 22 per cent. Practically all the pyrites produced in Greece comes from the mines of Isvoros in the Khalkidike Peninsula.

ALGERIA

Production of pyrites in Algeria amounted to approximately 16,000 metric tons in 1930, virtually the same as in 1929. The entire output is derived from the mines in the neighborhood of Philippeville, and the average sulphur content is given as 47 per cent by the department of mines.

CANADA

Production of pyrites in Canada, as measured by shipments, decreased from 70,087 metric tons in 1929 to 48,619 tons (52 per cent sulphur) in 1930, or nearly 31 per cent. This large decline was due to the decreased shipments from British Columbia, where the Britannia mill was producing pyrites flotation concentrates (53 per cent sulphur) in its treatment of copper ores. Production of pyrites in British Columbia decreased from 51,161 metric tons in 1929 to 25,886 tons in 1930, or nearly 50 per cent. The large decrease in production in British Columbia was partly offset by the increase in production in Quebec from 18,312 metric tons in 1929 to 22,605 tons (51 per cent sulphur) in 1930, or more than 23 per cent. The pyrites output in Quebec was produced by the Consolidated Copper & Sulphur Co. from the Eustis mine near Sherbrooke. Ontario, the only other Province contributing to the Canadian total, produced 128 metric tons from the Caldwell mine near Flower Station; in 1929, Ontario produced 614 tons. The Errington mine, which early in the year was reported to be producing 60 tons of iron pyrite flotation concentrates per day, discontinued operations the latter part of the year pending higher prices for the base metals.

The development, by Horace Freeman, of a new method[6] of burning pyrites has stimulated interest in the exploration and development of pyrites properties in Canada. Canadian Pyrites Co. (Ltd.) has been formed to acquire the pyrites holdings of the Grasselli Chemical Co. (Ltd.), a subsidiary of the Du Pont group, in the Goudreau-Michipicoten area, Ontario. In Quebec the Aldermac Mining Co. is developing a property in Beauchastel Township, Temiskaming County, about 10 miles west of Noranda.

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[6] Freeman, Horace, The Utilization of Pyrites in Pulp and Acid Manufacture: Canadian Inst. Min. and Met., Bull. 216, April, 1930, pp. 471-476.

FELDSPAR [1]

By H. Herbert Hughes and Jefferson Middleton

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GENERAL CONDITIONS

The feldspar industry in 1930 was characterized by further decreases in tonnage and value of both crude and ground feldspar. The average value of crude, $6.21 a long ton, was lower than that in any year since 1919. The steady decline in domestic ground feldspar values from the 1924 high level of $16.84 a short ton was accentuated by a drop from $13.73 a ton in 1929 to $12.95 in 1930. Nevertheless, one additional mill began operations during the year, thereby increasing the total grinding capacity, which is estimated conservatively to be at least three times as great as the annual consumption of ground feldspar. This combination of low prices and excess capacity has created a serious condition within the industry and has encouraged various plans for stabilization that have not as yet been successful.

VARIETIES

Feldspar is the name given to an important group of rock-forming minerals rather than to a single species, and the principal varieties of commerce are potash feldspar and soda feldspar. Microcline is the predominating potash feldspar, although in some deposits orthoclase has considerable importance. These two minerals are identical in chemical composition ($KAlSi_3O_8$). They differ solely in their form of crystallization, which normally can be detected only by microscopic examination.

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[1] Work on manuscript completed July, 1931.

Albite ($NaAlSi_3O_8$), the most important soda feldspar, is the end member of the plagioclase series, the other varieties being combinations of albite with the lime feldspar, anorthite ($CaAl_2Si_2O_8$). Oligoclase, the second of the series, is found abundantly in many deposits of soda spar. Intergrowths of albite with microcline or similar soda-potash combinations are common. The other less common feldspars have little commercial importance.

OCCURRENCE

All varieties of feldspar are of igneous origin. They comprise an appreciable part of most igneous rocks, especially granite and syenite, and their metamorphic equivalents. Arkosic sandstones are composed principally of feldspar grains intimately mixed with quartz. In all these rocks, however, the feldspar occurs as small crystal fragments ranging in size from microscopic particles to crystals half an inch or more across. The total quantity of feldspar so occurring is enormous but is of no commercial value because it can not be separated profitably from the minerals with which it is associated.

The feldspars of commerce are obtained from irregularly shaped lenses or elongated intrusive masses called pegmatite dikes. Generally, pegmatites differ from granites only in the size of the component crystals. Feldspar and quartz are the principal constituents, but they are associated characteristically with muscovite, biotite, tourmaline, garnet, beryl, and lesser quantities of other accessory minerals. The mining of feldspar is uncertain because of the irregularity and lack of uniformity of the dikes.

The most important deposits of feldspar in the United States are along the Atlantic seaboard from Maine to North Carolina. Their value depends upon their location as well as the quality of available spar. About 90 per cent of the total domestic production is from these eastern localities. In 1930, feldspar was mined also in California, Colorado, and South Dakota.

PHYSICAL PROPERTIES

All commercial varieties of feldspar have similar physical properties. Their hardness is 6 to 6.5, according to Moh's scale. Their specific gravity ranges from 2.55 for orthoclase and microcline to 2.76 for anorthite. They differ slightly, however, in color, luster, presence or absence of striations, and system of crystallization. Furthermore, each variety of spar has its own individuality which, although meaningless to the average person, is recognized immediately by an experienced picker.

USES

Nearly seven-eighths of all feldspar produced commercially in the United States is used as a flux in the manufacture of glass, pottery, enamel and sanitary ware, brick, and tile. Its usefulness in the ceramic industry depends upon the fact that it melts without becoming entirely fluid and, when cool forms a strong, colorless or only slightly colored glass. In most forms of pottery it is a constituent of both the body and the glaze. From 10 to 35 per cent is used in the body, where it binds the particles together. In glazes it comprises 30 to 50 per cent of the mix. Feldspar is one of the essential ingredients of opalescent glass, which is being used widely in modern building construction. This material is especially adaptable for use in hotels, restaurants, soda fountains, and similar places where a vitrified surface is desired. Bathtubs and wash bowls usually are made of cast iron and, while hot, are covered with an enamel containing considerable feldspar. Electrical insulators and similar forms of porcelain contain feldspar as one of the principal ingredients. Small quantities of hand-picked potash spar are used in the manufacture of artificial teeth, porcelain inlays, and similar dental supplies.

The use of feldspar in the glass industry is increasing, but little has been used in plate or window glass manufacture. This market comprises a large potential outlet for the mineral. The composition of feldspar approaches that of some types of glass, and its use increases the toughness and improves the luster of bottle and pressed-glass products. Furthermore, it prolongs the working temperature during the manufacturing process.

Clean pulverized feldspar is used as a constituent of scouring soaps and window-cleaning compounds. The quartz content of such material must be quite low, as the hard quartz particles would tend to scratch the surface of glass or enamel ware. Feldspar is used as a binder in the manufacture of emery wheels. Some of the other nonceramic uses provide an outlet for lower-grade material. Feldspar granules are used to surface prepared roofing, in general concrete work, as a coating for stucco and concrete building units, as sand-blast material, and for poultry grit. Graded in several sizes it is sold for foundry facings. Small quantities of pulverized low-grade feldspar are used in the manufacture of certain floor coverings; as a constituent of roofing material, sandpaper, paint, wood filler, and terra cotta; and as a flue-dust arrester. Many attempts have been made to utilize the potash content of feldspar as a fertilizer, but none has been successful commercially. Some varieties of feldspar are of value as semiprecious gem stones, but the quantity thus consumed is negligible.

The following summary shows the approximate percentage of feldspar consumed in the United States for the various uses.

Approximate percentage of feldspar consumed in various industries

Ceramic and glass industries	87
Scouring soaps and abrasives	7
Binder for abrasive wheels	2
Poultry grit, roofing, stucco, and other minor uses	4

SPECIFICATIONS AND TESTS

The principal requirement for feldspar for use in the glass or other ceramic industries is that it should fuse to a uniform white color entirely free from specks or spots. The primary aim of all specifications is to accomplish this end. All iron-bearing minerals are detrimental. Care should be taken to keep the content of biotite, garnet, hornblende, and black tourmaline at a minimum.

The quartz content of commercial spar varies considerably. For high-grade pottery it is limited to about 5 per cent, but for ordinary grades it may be 15 or 20 per cent or even higher. A high alumina content is desirable in glass making.

Manufacturers of clay wares demand a finely ground product, usually fine enough for 99 per cent to pass a 200-mesh screen. Glass and metal-enameling industries use coarser material. Glass manufacture ordinarily requires 20-mesh with a minimum of fines, whereas enameling commonly requires 100-mesh material. Occasionally, however, orders are received for 40, 60, 80, and 140 mesh for both of these purposes.

During the past decade the entire feldspar industry has undergone a marked change of attitude toward specifications. Ten years ago few consumers could have given specifications, and even if they had the producers were in no position to meet them. The need for uniformity was evident, but the nature of the deposits and the methods of grinding were such that little could be done to obtain a uniform product.

The present situation is entirely different. Many consumers insist on giving chemical, mineral, and even grinding specifications. Furthermore, the producers can meet these requirements within reasonable limits of accuracy. One of the principal difficulties encountered in attempting to arrive at exact specifications has been the lack of a definite classification of feldspars. A forward step was taken on January 14, 1930, when a general conference of producers, grinders, and users recommended the adoption of a commercial standard for feldspar. A committee was appointed by the division of trade standards of the Bureau of Standards, and the results of its investigation have been published as Bureau of Standards Commercial Standard 23–30 entitled "Feldspar." This report can be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 5 cents.

The information in this publication should be regarded as a classification rather than a definite purchase specification. It covers both screen analysis and chemical composition of ground feldspar used in the manufacture of glass and other ceramic products. The scheme of classification became effective for feldspar produced on and after September 1, 1930. It is too soon to judge the merits of the plan, but preliminary evidence indicates that it is being well received.

TECHNICAL DEVELOPMENTS

The trend toward standardization and uniformity of feldspar has not been brought about by the demands of consumers alone; in fact, in many instances the producers not only have taken the initiative but also have educated the consumers to appreciate new developments. The foremost advance during the past few years, which was carried still further in 1930, is absolute technical control of the finished product. This applies not only to chemical control of uniformity in both blended and individual spars but also to mechanical control of grinding equipment. The modern feldspar grinding mill can produce a uniform product and is designed to permit changing from one set of specifications to another with no decrease in efficiency.

During 1930 a new product called granular glasspar was developed and placed on the market. This material is intended to meet the demand in the glass industry for a more granular and dustless spar. Several advantages are claimed for this new product; it flows freely, reduces dust, lessens batch separation when used with other granular ingredients, requires less heat, and makes a quicker and more uniform melt.

Glasspar is produced by a new process of grinding combined with the use of an induction-type magnetic separator to reduce the iron content. The material from the dryer is passed over screens in closed circuit with the mill so that it is reduced to 20-mesh. After being split into two sizes by another screen it passes to the magnetic separator and from there to mixing or blending bins.

Use of the induction-type separator was adopted only after extensive experiments during which various types of concentrating equipment were used in attempts to reduce the iron content of the spar. Dry and wet tables and magnetic and electrostatic separators were tried. The sensitivity of the induction separator is so great that it removes not only the iron contamination and iron-bearing minerals but also much of the muscovite mica. The iron content of run-of-mine spar has been reduced to 0.05 to 0.06 per cent, as compared with about 0.1 per cent with careful hand picking. Weis[2] discussed this process before the American Ceramic Society, and a description of the equipment was given in Chemical and Metallurgical Engineering[3] and in other trade journals.

In October, 1930, the Bureau of Mines published a general information circular on feldspar by Bowles and Lee.[4] This paper, which contains a fairly complete discussion of the industry, may be procured free by writing to the section of publications, Bureau of Mines, Washington, D. C.

MARKETING

The demand for feldspar depends directly upon conditions in the various ceramic industries. It is estimated that approximately 179,400 tons of the 181,541 short tons of ground feldspar sold in the United States in 1930 were consumed in the manufacture of glass and other ceramic products. The principal markets for ground feldspar are segregated in well-defined areas in New York, New Jersey, West Virginia, Ohio, and Indiana. Trenton, N. J., and the district near East Liverpool and Sebring, Ohio, are the most important consumption centers. The location of any deposit with respect to markets has vital importance, for profitable operation may depend directly upon favorable freight rates.

Virtually all feldspar is sold in carload lots. Several large companies are completely integrated, being engaged in the mining, grinding, and selling of spar. Others market their product through a special selling agency. Still others buy all or part of their crude spar from small producers to supply their grinding mills; in fact, the only appreciable outlet for the crude spar produced by hundreds of small operators is through a custom mill. Quantities less than carload lots usually are handled by brokers or supply houses. There is little seasonal fluctuation in feldspar consumption, but weather conditions may necessitate building up large stocks to maintain deliveries during the winter season.

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[2] Weis, J. H., Granular and Ground Feldspar with a Uniformly Low Iron Content: Jour. Am. Ceram. Soc., vol. 14, No. 5, 1931, pp. 413–418.

[3] Chemical and Metallurgical Engineering, Purifying Ground Feldspar Magnetically: Vol. 37, No. 11, 1930, p. 688.

[4] Bowles, Oliver, and Lee, C. V., Feldspar: Inf. Circ. 6381, Bureau of Mines, 1930, 21 pp.

Feldspar is shipped either in bulk or in bags. Cars for bulk shipments usually are lined with paper, but this precaution is not always taken. When spar is shipped in burlap bags the consumer is billed for the bags, but credit is allowed upon their return. More recently the Feldspar Grinders Institute (Inc.) has advocated the use of paper bags designed to hold 100 pounds each. These bags are billed to the consumer at cost, with no return privileges. The shipment of feldspar in bags is preferable because, in addition to easier handling, there is less loss of spar and less contamination in transit.

TARIFF

The tariff act of 1930, effective June 18, levied a duty of $1 a ton on crude feldspar imported into the United States and of 30 per cent ad valorem on ground feldspar imported. There is no change in duty under this act on ground feldspar, but crude feldspar entered free of duty under the act of 1922.

PRODUCTION

CRUDE FELDSPAR

The term "crude feldspar" is applied to the lump spar shipped from the mine or quarry, as contrasted with ground spar which is the finished product of the crushing and pulverizing mill. Statistics of production are presented separately for crude and ground spar. In accordance with the practice common in the industry the crude is reported in long tons of 2,240 pounds and the ground in short tons of 2,000 pounds.

The crude feldspar sold or used by producers in the United States in 1930 amounted to 171,788 long tons, valued at $1,066,636, a decrease of 13 per cent in quantity and 16 per cent in value as compared with 1929. The average value of crude feldspar in 1930 at the mine or shipping point nearest thereto was $6.21 a long ton, or 25 cents lower than that in 1929 and 52 cents lower than that in 1928. The average value for crude feldspar as reported by individual producers ranged from $2.75 to $12.32 a long ton. For New England the value ranged from $4.50 to $12.32; for New York, Pennsylvania, and Virginia, from $3.67 to $10.56; for North Carolina, from $5 to $6.61; and for the far Western States, from $2.75 to $9.74. Crude feldspar was reported from 10 States in 1930. Arizona and Maryland, producers for several years, reported no output in 1930. North Carolina continued to be the leading producing State and in 1930 reported 60 per cent of the total quantity, Maine was second with 13 per cent, and New Hampshire was third with 10 per cent. Maine was the only one of these three States to show an increase in sales of crude feldspar in 1930, but North Carolina's output in 1930 was only slightly less than that in 1929.

Crude feldspar sold or used by producers in the United States, 1921–1930

Year	Long tons	Value		Year	Long tons	Value	
		Total	Average			Total	Average
1921	91,865	$617,652	$6.72	1926	209,989	$1,607,101	$7.65
1922	117,127	844,568	7.21	1927	202,497	1,424,755	7.04
1923	145,004	1,057,595	7.29	1928	210,811	1,418,975	6.73
1924	204,772	1,509,339	7.37	1929	197,699	1,276,640	6.46
1925	185,706	1,315,654	7.08	1930	171,788	1,066,636	6.21

Crude feldspar sold or used by producers in the United States, 1925–1930, by States

[Value is at mine or nearest shipping point]

State	1925		1926		1927	
	Long tons	Value	Long tons	Value	Long tons	Value
Arizona	(1)	(1)	(1)	(1)	(1)	(1)
California	6,077	$49,881	6,271	$49,300	5,260	$43,329
Colorado	(1)	(1)	(1)	(1)	(1)	(1)
Connecticut	10,426	71,201	11,436	87,844	6,123	43,319
Maine	28,404	256,731	33,897	306,695	34,328	299,386
Maryland	4,554	26,438	(1)	(1)	2,001	11,612
New Hampshire	38,366	278,736	33,271	287,596	27,449	223,077
New York	10,474	70,446	15,517	157,865	12,020	96,446
North Carolina	76,806	496,563	91,433	602,020	100,756	612,214
Pennsylvania	1,330	4,722	1,484	4,492	3,938	24,257
South Dakota	(1)	(1)	(1)	(1)	(1)	(1)
Virginia	(1)	(1)	(1)	(1)	(1)	(1)
Undistributed	9,269	60,936	16,680	111,289	10,622	71,115
	185,706	1,315,654	209,989	1,607,101	202,497	1,424,755

State	1928		1929		1930	
	Long tons	Value	Long tons	Value	Long tons	Value
Arizona	(1)	(1)	(1)	(1)	----------	----------
California	11,891	$81,199	12,770	$84,567	6,519	$54,941
Colorado	(1)	(1)	(1)	(1)	1,933	10,575
Connecticut	6,292	48,996	2,726	21,056	(1)	(1)
Maine	25,063	202,219	19,992	142,042	22,738	161,631
Maryland	2,349	10,325	2,624	19,610	----------	----------
New Hampshire	30,343	236,224	30,964	231,810	16,517	132,342
New York	13,971	120,559	12,696	103,531	5,556	37,790
North Carolina	105,560	630,042	103,273	598,938	103,163	593,552
Pennsylvania	2,052	8,851	(1)	(1)	(1)	(1)
South Dakota	(1)	(1)	(1)	(1)	(1)	(1)
Virginia	(1)	(1)	6,677	38,628	6,760	38,048
Undistributed	13,290	80,560	5,977	36,458	8,602	37,757
	210,811	1,418,975	197,699	1,276,640	171,788	1,066,636

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[1] Included under "Undistributed."

GROUND FELDSPAR

Probably all the feldspar consumed industrially, except that used for facing cement blocks, for covering prepared roofing, for "chicken grits," and for like purposes, is prepared by fine grinding. Even for such uses the spar is at least crushed to small sizes and more or less graded by screening. It has not been practicable to canvass all users of feldspar to determine the amounts ground and used by them, but all known merchant mills or grinders—that is, those that quarry or purchase crude spar and grind it for sale to other establishments—have been canvassed during the last nine years for statistics of ground feldspar.

The quantity of ground feldspar sold by the commercial mills in 1930 was 181,541 short tons, valued at $2,450,915, a decrease of 49,041 tons, or 21 per cent, in quantity, and $845,337, or 26 per cent, in value, as compared with 1929. In the 12 States reporting, there were 30 operators running 34 mills, an increase of 1 operator and 1 mill but a decrease of 1 State. Connecticut and Maryland reported no ground feldspar in 1930, and Colorado reentered the list of feldspar grinders. Of the mills reporting, 30 worked exclusively on domestic spar, 3 exclusively on imported spar, and 1 on both domestic and imported spar. Of the total quantity 167,380 short tons, or 92 per cent, were from domestic spar and 14,161 tons, or 8 per cent, from imported spar.

In 1930 the average value of ground spar per ton from domestic crude was $12.95, the lowest recorded in recent years and a decrease of 78 cents as compared with 1929, $1.60 as compared with 1928, and $3.89 as compared with 1924, the year of highest recorded average; the average value in 1930 in the several States ranged from $10.35 to $22 per ton. The average value of ground feldspar from imported crude was $20.02, an increase of 2 cents as compared with 1929, but a decrease of $1.11 as compared with 1927, the year of highest recorded value. Whereas the average value of ground spar from domestic crude in 1930 was considerably less—23 per cent—than the high average of 1924, the average value of ground spar from imported crude has declined only slightly—5 per cent—from its highest average value. Direct comparison of values is, however, misleading, as figures for Canadian spar generally relate to high-grade materials at mills near points of consumption, whereas figures for domestic spar cover all grades at various points, many of which are distant from consuming centers.

Ground feldspar sold by merchant mills[1] *in the United States, 1922–1930*

Year	Number of operators	Domestic			Canadian[2]			Total	
		Short tons	Value		Short tons	Value		Short tons	Value
			Total	Average		Total	Average		
1922	20	107,969	$1,790,305	$16.58	19,075	$364,082	$19.09	127,044	$2,154,387
1923	26	151,855	2,486,810	16.38	25,374	486,546	19.17	177,229	2,973,356
1924	30	163,905	2,760,286	16.84	25,875	522,884	20.21	189,780	3,283,170
1925	33	184,816	3,017,845	16.33	28,042	586,000	20.90	212,858	3,603,845
1926	29	199,215	3,246,174	16.29	26,147	529,623	20.26	225,362	3,775,797
1927	30	194,672	2,946,154	15.13	[2] 29,243	[2] 617,987	21.13	223,915	3,564,141
1928	29	202,844	2,951,281	14.55	[2] 24,813	[2] 507,747	20.46	227,657	3,459,028
1929	[3] 29	209,808	2,880,824	13.73	20,774	415,428	20.00	230,582	3,296,252
1930	30	167,380	2,167,352	12.95	14,161	283,563	20.02	181,541	2,450,915

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[1] Does not include potters or others who grind for consumption in their own plants.

[2] Figures for 1927 and 1928 include some Cornwall stone.

[3] Revised figures.

Ground feldspar sold by merchant mills[1] *in the United States, 1929 and 1930, by States*

State	1929					1930				
	Number of operators	Domestic		Canadian		Number of operators	Domestic		Canadian	
		Short tons	Value	Short tons	Value		Short tons	Value	Short tons	Value
California	3	11,917	$152,574	--------	--------	3	6,016	$85,532	--------	--------
Connecticut	1	(2)	(2)	--------	--------	--------	--------	--------	--------	--------
Maine	4	21,296	365,017	--------	--------	4	16,116	256,285	--------	--------
New Jersey	4	22,764	434,095	--------	--------	4	14,784	276,626	--------	--------
New York	[3] 3	(2)	(2)	(2)	(2)	5	6,619	88,847	(2)	(2)
Ohio	2	(2)	(2)	(2)	(2)	2	(2)	(2)	(2)	(2)
North Carolina	5	105,626	1,236,206	--------	--------	5	92,714	1,012,915	--------	--------
Tennessee	1					1				
Undistributed [4]	6	48,205	692,932	20,774	$415,428	6	31,131	447,147	14,161	$283,563
	[3] 29	209,808	2,880,824	20,774	415,428	30	167,380	2,167,352	14,161	283,563

[1] Does not include potters or others who grind for consumption in their own plants.

[2] Included under "Undistributed."

[3] Revised figures.

[4] 1929: Connecticut, Illinois, Maryland, New Hampshire, New York, Ohio, South Dakota, and Virginia. 1930: Colorado, Illinois, New Hampshire, New York (imported), Ohio, South Dakota, and Virginia.

INDUSTRY BY STATES

General data.—The production (or sales) of crude feldspar was reported from 10 States in 1930, as compared with 12 States in 1929. Arizona, which has been a producer of feldspar since 1923, and Maryland, which has been a producer for many years, reported none for 1930. The producing States in 1930, arranged in the order of their importance, were North Carolina, Maine, New Hampshire, South Dakota, Virginia, California, New York, Colorado, Connecticut, and Pennsylvania. North Carolina and Pennsylvania were the only States that maintained the same relative ranks in 1929 and 1930, namely, first and last. South Dakota rose from seventh to fourth in rank, California dropped from fourth to sixth, and New York dropped from fifth to seventh. The other States varied only slightly in relative rank, as compared with 1929. The first three States, as listed above, reported 83 per cent of the total sales of crude feldspar in 1930. The principal producing region is along the Atlantic seaboard from Maine to North Carolina, and this region reported 91 per cent of the total output in 1930. Feldspar was ground in commercial mills in 1930 in each of the producing States except Connecticut and Pennsylvania. Mills grinding feldspar were also operated in Illinois, New Jersey, Ohio, and Tennessee. Three States showed increases in both quantity and value of crude spar output; 3 States showed increases in output of ground spar; and 2 States, South Dakota and Virginia, showed increases in value of output of ground spar.

California.—The output and value of both crude and ground feldspar in California decreased in 1930, as compared with 1929. The output of crude spar decreased 6,251 tons, or 49 per cent, while the value decreased $29,626, or 35 per cent. This State ranked sixth in quantity and fourth in value of crude spar. The quantity of ground spar marketed decreased 5,901 tons, or 50 per cent, and the value $67,042, or 44 per cent. Mills were operated in 1930 by the American Encaustic Tiling Co. (Ltd.) and the Flynt Silica & Spar Co., both of Los Angeles, and the Standard Sanitary Manufacturing Co., of Richmond. Early in 1931 the Consolidated Feldspar Corporation, Trenton, N. J., acquired the mill of the Flynt Silica & Spar Co.

Colorado.—Colorado was one of the three States to show increase in both output and value of crude feldspar in 1930, as compared with 1929; the increase was very large, and the State ranked eighth in quantity and ninth in value. A mill was operated by the Western Feldspar Milling Co. at Denver.

Connecticut.—In 1930 Connecticut ranked ninth in output and eighth in value of crude spar. For the first time in many years no ground spar was reported from this State.

Illinois.—No crude spar is produced in Illinois. In 1930 one mill was operated by the Abingdon Sanitary Manufacturing Co. at Abingdon. Spar from South Dakota was ground there for use of the company, some being sold.

Maine.—In 1930 Maine ranked second among the States in production and value of crude feldspar and third in output and fourth in value of ground spar. In 1929 it ranked third in quantity and value of crude spar and fourth in quantity and value of ground spar. The output and value of crude spar in this State increased in 1930 as compared with 1929, but the output and value of ground spar decreased. Crude spar increased 14 per cent in both quantity and value. Ground spar decreased 24 per cent in output and 30 per cent in value. Maine reported 13 per cent of the total quantity of domestic crude spar and 15 per cent of the total domestic value; it furnished 10 per cent of the domestic ground spar marketed which was valued at 12 per cent of the total. Androscoggin, Cumberland, Oxford, and Sagadahoc were the producing counties, Sagadahoc County reporting more than one-half of the output.

Most of the spar mined in Maine is ground in the mills of the State, which were operated in 1930 by the Consolidated Feldspar Corporation, Trenton, N. J., with mills at Auburn and Topsham; the J. W. Cummings Feldspar Co., at Bath; the Trenton Flint & Spar Co., Trenton, N. J., with mill at Cathance; and the Oxford Mining & Milling Co., West Paris, with mill at Bates.

New Hampshire.—In 1930 New Hampshire ranked third in quantity and value of crude spar and fifth in quantity and value of ground spar. This State reported 10 per cent of the total output of crude spar and 12 per cent of its value. Ground spar was reported by the American Mineral Products Co. (Inc.), New York, N. Y., with mill at Cold River, and the Golding-Keene Co., with office and mill at Keene. This is an increase of one mill, as compared with 1929. Notwithstanding the increase in the number of mills the output and value of ground feldspar in this State showed a large decrease.

New Jersey.—New Jersey produces no crude feldspar, but it is an important State in the industry as it is a large producer of ground feldspar and a large consumer of that material in its pottery industry. At Trenton are the mills of the Eureka Flint & Spar Co., the Golding Sons Co., the Standard Flint & Spar

Corporation, and the Trenton Flint & Spar Co. During 1930 the Trenton mill of the Trenton Flint & Spar Co. was purchased by the Consolidated Feldspar Corporation.

In 1930 the State ranked fourth in quantity and third in value of domestic ground spar sold. The mills reported 14,784 short tons of ground spar sold, valued at $276,626, or 9 per cent of the total quantity of domestic ground spar and 13 per cent of the total value, and a decrease of 35 per cent in quantity and 36 per cent in value as compared with 1929.

New York.—In 1930 New York ranked seventh in quantity and sixth in value of crude spar and seventh in both quantity and value of domestic ground spar. It is the largest grinder of Canadian spar and ranked third in 1930 in the total production of ground spar. Its output of crude spar in 1930 came from Fulton, St. Lawrence, and Westchester Counties. The quantity and value of crude spar decreased 56 and 63 per cent, respectively, as compared with 1929. There were 7 active mills, 2 more than in 1929, as follows: The Consolidated Feldspar Corporation (Trenton, N. J.), with 3 mills, 1 at Bedford and 2 at Rochester; the United States Feldspar Corporation, at Cranberry Creek; the Crown Point Chemical Co. (Inc.), at Crown Point; the Green Hill Mining Co. (Inc.), Gouverneur, with mill at De Kalb; and the Genesee Feldspar Co. (Inc.), at Rochester.

North Carolina.—In 1930, as for many years, North Carolina was the largest producer of crude spar; it was also, for the third time, the largest producer of ground spar. The output of crude spar in North Carolina in 1930 was 60 per cent of the total and nearly five times that of Maine, the second State. The output and value of crude spar in 1930 were practically the same as in 1929, as there was a decrease of only 110 tons in output and of $5,386 in value, or less than 1 per cent. The quantity marketed in 1930 was exceeded only by the output in 1928 and 1929, but the value of the 1930 output was exceeded by that in five years—1924 (the record year for value), 1926, 1927, 1928, and 1929. The average value per ton of crude spar in 1930 in North Carolina was $5.75, as compared with $5.80 in 1929 and $5.97 in 1928. A considerable part (nearly one-half) of the output was made by numerous small producers who sell their feldspar to some larger user or distributing agency. Those reporting such purchases in 1930 were the Carolina Mineral Co. (Inc.) and the Tennessee Mineral Products Corporation, both at Spruce Pine; the Feldspar Milling Co. (Inc.), Burnsville; the North State Feldspar Corporation, Micaville; and the Southern Feldspar (Inc.), Toecane. In 1930 most of the spar (more than 70 per cent of the State total) was produced in Mitchell County. Feldspar was also produced in Avery and Yancey Counties.

Five grinding mills were operated in North Carolina in 1930—one by each of the following: The Feldspar Milling Co. (Inc.), with office at Burnsville and mill at Bowditch; the North State Feldspar Corporation, Micaville; Golding Sons Co., with office at Trenton, N. J., and mill at Spruce Pine; the Tennessee Mineral Products Corporation, Spruce Pine; and the Southern Feldspar (Inc.), Toecane. The mills in North Carolina and Tennessee reported 92,714 short tons of domestic ground spar, or 55 per cent of the total domestic sold in 1930; it was valued at $1,012,915, or 47 per cent of the total value. The output of ground feldspar in this region in 1930 decreased 12,912 tons, or 12 per cent, in quantity, and $223,291, or 18 per cent, in value, as compared with 1929.

Ohio.—No feldspar is produced in Ohio, but this State and the adjoining territory in Pennsylvania and West Virginia produce more than one-half of the high-grade pottery made in the United States; hence, the region is a large consumer of feldspar. The potteries are partly supplied by mills in Ohio, which are operated by the Golding Sons Co. at East Liverpool and the Rock Products Co. at Silica, near Toledo. The Golding Sons Co. ground only domestic spar, and the Rock Products Co. ground only Canadian spar.

Pennsylvania.—Pennsylvania ranked last among the States in both quantity and value of crude spar in 1930. Only one operator sold crude feldspar in this State in 1930.

South Dakota.—The output of both crude and ground feldspar in South Dakota increased greatly in 1930 as compared with 1929. As there were only two operators in the State it is impossible to publish figures without disclosing confidential information.

Tennessee.—Tennessee is another State that has no feldspar mines but is a large producer of ground feldspar; it ranked second in 1930 in quantity of ground feldspar sold. The Erwin Feldspar Co. (Inc.), with office in Trenton, N. J., and mills at Erwin, is the only operator in the State.

Virginia.—The output of crude feldspar in Virginia increased slightly while its value decreased slightly in 1930 as compared with 1929. Some of the crude feldspar from Bedford County is reported as having been exported to France. The only mill in the State is that of the Seaboard Feldspar Co. (of Baltimore, Md.) at Brookneal.

IMPORTS[5]

In recent years about one-eighth of the new supply of crude feldspar has been imported from Canada. Before 1922 imports of feldspar were not specifically classified in the official records of the Bureau of Foreign and Domestic Commerce and are therefore unknown. The table that follows shows the imports of feldspar from 1922 to 1930. This table shows that the imports of crude feldspar decreased 8,921 long tons, or 30 per cent, in quantity, and $74,695, or 31 per cent, in value in 1930 as compared with 1929.

Feldspar imported for consumption in the United States, 1922–1930

Year	Crude		Crushed or ground		Year	Crude		Crushed or ground	
	Long tons	Value	Short tons	Value		Long tons	Value	Short tons	Value
1922[a]	7,549	$60,111	41	$538	1927	27,424	$206,856	([b])	$3
1923	24,271	184,924			1928	27,857	224,920	55	1,091
1924	35,139	284,716			1929	29,927	241,852	3	131
1925	24,994	203,524			1930	21,006	167,157	57	586
1926	29,941	251,896	41	1,743					

[a] Sept. 22 to Dec. 31. Not separately classified prior to change in tariff.
[b] 250 pounds.

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[5] Figures on imports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

WORLD PRODUCTION

The following tables show the most recent figures of production of feldspar in the chief producing countries. Besides the United States and Canada, the important producing countries are Norway, Russia, and Sweden. Although Great Britain has an immense pottery industry, it appears to have produced no feldspar in recent years. Cornwall stone, rather than feldspar, is extensively used as a flux in the British pottery industry.

World production of feldspar, 1926–1930, by countries, in metric tons

[Compiled by M. T. Latus, of the Bureau of Mines]

Country [1]	1926	1927	1928	1929	1930
Argentina (shipments)	----------	185	410	427	(2)
Australia:					
New South Wales	11	[3] 16	[3] 49	[3] 58	[3] 86
South Australia [3]	105	93	115	----------	----------
Western Australia (exports)	8	----------	----------	21	(2)
Canada (shipments)	32, 614	27, 078	28, 936	34, 044	24, 309
Finland (exports)	738	553	720	459	(2)
France	10, 550	15, 000	23, 000	(2)	(2)
Germany (Bavaria)	6, 660	7, 320	6, 230	7, 697	5, 150
Italy	5, 878	4, 054	4, 960	6, 800	5, 750
Norway (exports)	20, 510	27, 650	24, 075	26, 524	(2)
Rumania	1, 700	1, 943	2, 835	2, 479	1, 963
Russia [4]	18, 640	19, 324	20, 308	(2)	(2)
Sweden	33, 970	30, 636	39, 921	39, 092	(2)
Union of South Africa	101	29	30	----------	----------
United States (shipments)	213, 359	205, 747	214, 195	200, 872	174, 545

[1] In addition to the countries listed feldspar is produced in Czechoslovakia. Official figures of output are not available, but it is estimated that the annual production is approximately 30,000 metric tons.
[2] Data not available.
[3] Includes some china stone.
[4] Year ended Sept. 30.

Feldspar, produced in Canada, sold in 1921–1930

Year	Long tons	Value	Year	Long tons	Value
1921	26, 668	$230, 754	1926	32, 099	$310, 238
1922	24, 756	248, 402	1927	26, 651	259, 151
1923	26, 094	237, 601	1928	28, 479	284, 942
1924	40, 004	358, 540	1929	33, 506	340, 471
1925	25, 608	235, 789	1930	23, 925	268, 469

ABRASIVE MATERIALS[1]

By Paul Hatmaker and A. E. Davis[2]

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INTRODUCTION

Industrial utilization of abrasive materials ranges from the cutting of the hardest metals and rocks with diamonds to the polishing of rice and peanuts with talc. A great variety of mineral products is used either wholly or partly as abrasives; to group these under one heading is desirable, although many of the commodities so listed have other and perhaps more important utilization. As far as possible, statistics are confined to that part of the production used as abrasives. For example, figures for abrasive sandstone (such as grindstones, pulpstones, and whetstones), comprising only a small part of the sandstone industry, are easily segregated from the greater quantity used in the building industries. On the other hand, as it is impossible to make a separation by uses with diatomite, pumice and pumicite, and tripoli, the entire production is included in the figures for abrasives. Certain other minerals, such as quartz and feldspar, are considered in the Mineral Resources chapters entitled "Silica" and "Feldspar," because the extent to which they are used as abrasives is limited and the figures can not be determined with reasonable accuracy.

Abrasive materials are of two kinds, natural and artificial. Natural abrasives include emery and garnet, used in the manufacture of coated abrasive papers, and diamonds, used in saws to cut stone and in core drills; the term is properly applied to any mineral used for cutting, grinding, or polishing which requires no other preparation than shaping, sizing, separation from impurities, or bonding into suitable forms. Artificial abrasives are synthetic compounds, mostly products of the electric furnace.

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[1] Work on manuscript completed July, 1931.

[2] Figures on production compiled by Miss A. T. Coons and Miss A. E. Davis, of the Bureau of Mines. Data on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

This report deals particularly with natural abrasives. Their production includes a number of widely scattered dissimilar enterprises engaged in placing various products on the market. Not many of these enterprises would be considered large if compared with other mining industries, but individually as well as collectively they are important elements in the industrial life of the Nation. They supply not only the tools for grinding, polishing, and other abrasive operations but also the ingredients of cleansing compounds, without which the wood, leather, glass, metal-working, and other industries, as well as many householders, would be put to great expense and inconvenience in the use of substitutes.

Artificial abrasives are finding very wide use as substitutes for natural abrasives. Therefore, they are considered briefly in this report for purposes of comparison and because of their strong influence on the marketing of the natural products.

In addition to these, sand used for grinding and polishing is also considered briefly in this report, although complete figures appear in the Mineral Resources chapter on Sand and Gravel.

NATURAL ABRASIVES

Under the head of natural abrasives in this report are included millstones and related quarry products, such as chasers, dragstones, and paving stone for chaser mills; grindstones and pulpstones; oilstones and other whetstones, hones, scythestones, and rubbing stones; corundum and emery; abrasive garnet; tripoli; diatomite (diatomaceous earth); pumice; and pebbles for grinding and lining for tube mills. These natural abrasives were produced in 1930 in 26 States, as follows:

Arizona	Pumice.
Arkansas	Oilstones and tripoli.
California	Diatomite, grinding pebbles, pumice, and pumicite.
Georgia	Tripoli.
Idaho	Diatomite.
Illinois	Grindstones and tripoli.
Indiana	Rubbing stones and whetstones.
Kansas	Pumicite.
Michigan	Grindstones.
Minnesota	Grinding pebbles and tube-mill lining.
Missouri	Tripoli.
Nebraska	Pumicite.
Nevada	Diatomite.
New Hampshire	Garnet and millstones.
New York	Diatomite, emery, garnet, and millstones.
North Carolina	Millstones.
Ohio	Grindstones, pulpstones, rubbing stones, scythestones, and whetstones.
Oklahoma	Tripoli.
Oregon	Diatomite.
Pennsylvania	Rottenstone.
South Dakota	Pumicite.
Tennessee	Tripoli.
Vermont	Scythestones.
Virginia	Diatomite and millstones.
Washington	Diatomite and pulpstones.
West Virginia	Grindstones and pulpstones.

MILLSTONES

The value of the millstones or burrstones and related quarry products—chasers, dragstones, and pavers—sold by producers in the United States in 1930 was $17,702, a decrease of 44 per cent from 1929. During the past ten years Ulster County, N. Y., has been the principal source of production, the largest number of producers having reported from that region.

American millstones have been and are still for the most part made of quartz sandstone and conglomerate, chiefly in Ulster County, N. Y., and Montgomery County, Va. Millstones are also made of granite, particularly in New Hampshire and North Carolina. The production recorded in Mineral Resources includes only the stones made for other than purely local use. Doubtless a large number of stones have been made in many unrecorded localities as local use has required, and they have been made of other rocks than those specified, particularly in the mountain sections of the Southern States. Formerly the millstone-manufacturing industry was much larger than at present. About 1880 the total value of the stones produced and sold in the United States was around $200,000 annually. The production has declined since the late eighties and during the last ten years has been less than $50,000 worth of stones annually. The decline is due in part to the fact that the manufacture of millstones is a handcraft in which, as in many others in the United States, the old master craftsmen, who are gradually disappearing, are not being replaced. In part, also, the change is due to new processes in the grain, paint, and mineral milling industries in which the old-style burrstones and chaser mills are being supplanted by grinding equipment of an entirely different type.

Value of millstones, chasers, and dragstones sold by producers in the United States, 1921–1930

Year	New York		Other States [1]		Total	
	Producers	Value	Producers	Value	Producers	Value
1921	12	$14,672	7	$9,852	19	$24,524
1922	12	17,025	4	3,828	16	20,853
1923	17	14,344	4	7,885	21	22,229
1924	17	18,215	5	11,910	22	30,125
1925	13	14,063	5	8,427	18	22,490
1926	12	23,629	7	22,308	19	45,937
1927	12	26,015	5	9,423	17	35,438
1928	14	26,224	6	16,662	20	42,886
1929	11	18,147	5	13,260	16	31,407
1930	7	6,577	5	11,125	12	17,702

[1] 1921: Alabama, New Hampshire, North Carolina, and Virginia; 1922: Alabama, North Carolina, and Virginia; 1923: Maine, Minnesota, North Carolina, and Virginia; 1924–1928 and 1930: New Hampshire, North Carolina, and Virginia; 1929: North Carolina and Virginia.

GRINDSTONES AND PULPSTONES

Grindstones and pulpstones are made chiefly from sandstone quarried in northeastern Ohio, western West Virginia, and eastern Michigan, and in Pierce County, Wash. In 1930 grindstones were also made from sandstone quarried in Illinois; these stones were shaped by the company using the stones and were not marketed. The total output of grindstones and pulpstones in the United States in 1930 was 18,700 short tons, valued at $770,571, a decrease of 33 per cent in quantity and 38 per cent in value compared with 1929. As may be noted from the following table, which shows the production over a period of years, the tonnage of grindstones produced has gradually declined, undoubtedly because of the substitution of manufactured abrasive wheels for the natural stones. Segmental pulpstones, which are constructed of artificial abrasives and attached to a core of concrete or metal, are finding increasing use as substitutes for natural pulpstones. The manufacture of artificial grindstones from crushed sandstone, sand, and cement, shaped in molds of desired size, is also being considered.

Grindstones and pulpstones sold by producers in the United States, 1921–1930

Year	Grindstones		Pulpstones		
	Short tons	Value	Pieces	Short tons	Value
1921	16, 310	$477, 259	2, 941	10, 030	$750, 063
1922	21, 367	574, 900	[1] 1, 619	[1] 5, 157	[1] 445, 286
1923	37, 384	1, 008, 899	2, 533	9, 186	680, 416
1924	28, 991	852, 260	2, 660	9, 193	814, 409
1925	28, 970	864, 637	2, 530	8, 370	841, 302
1926	28, 669	875, 240	2, 804	9, 670	997, 994
1927	23, 222	633, 207	2, 707	8, 709	921, 543
1928	24, 222	606, 408	2, 461	9, 016	902, 429
1929	21, 071	617, 618	1, 834	6, 665	623, 928
1930	14, 559	423, 835	1, 176	4, 141	346, 736

[1] Exclusive of sales in Washington prior to 1923.

The companies producing grindstones and pulpstones for commercial purposes in the United States in 1930, with the locations of the deposits from which the stone was obtained, were as follows:

MICHIGAN

Huron County: Grind Stone City—The Cleveland Quarries Co. (address, Cleveland, Ohio); grindstones.

OHIO

Cuyahoga County: Berea—The Cleveland Quarries Co. (address, Cleveland); grindstones.
Holmes County:
    Glenmont—The Briar Hill Stone Co.; grindstones.
    Killbuck—Mount Pisbia Stone Co. (address, Elyria); grindstones.
Jefferson County: Empire—Smallwood Stone Co. (address, Steubenville); pulpstones.
Lorain County:
    Amherst—The Cleveland Quarries Co. (address, Cleveland); grindstones.
    Columbia Station—Columbia Stone Co.; grindstones.
    Kipton—The Nicholl Stone Co. (address, Lorain); grindstones.
Washington County:
    Constitution—The Constitution Stone Co.; grindstones.
    Marietta—
        The Cleveland Quarries Co. (address, Cleveland); grindstones.
        The Hall Grindstone Co.; grindstones.
        Ohio Valley Stone Co.; grindstones.

WASHINGTON

Pierce County: Wilkeson—Walker Cut Stone Co. (address, Tacoma); pulpstones.

WEST VIRGINIA

- Boone County: Jeffery—The International Pulpstone Co. (address, Elyria, Ohio); pulpstones.
- Jackson County: Ravenswood—The Constitution Stone Co. (address, Constitution, Ohio); grindstones.
- Monongalia County:
  - Fairmont (near)—The Smallwood-Low Stone Co. (address, Fairmont); pulpstones.
  - Morgantown—The West Virginia Pulpstone Corporation (address, Cleveland, Ohio); pulpstones.
  - Opekiska—
    - The General Stone Co. (address, Amherst, Ohio); pulpstones.
    - Smallwood Stone Co. (address, Steubenville, Ohio); pulpstones.
  - Uffington—Uffington Stone Co.; pulpstones.
- Wetzel County: Littleton—American Stone Co.; grindstones and pulpstones.

OILSTONES AND OTHER WHETSTONES, SCYTHESTONES, RUBBING STONES, AND SIMILAR PRODUCTS

Natural stone or quarry products used as abrasive material include, besides the millstones, grindstones, and pulpstones considered above, oilstones and other whetstones, hones, rubbing stones, and scythestones. These are cut or otherwise shaped, usually in small pieces, in a great variety of forms for the special uses indicated by their names. Oilstones are produced in the United States from novaculite quarried in Arkansas; other whetstones chiefly from sandstone quarried in Indiana and Ohio; scythestones from sandstone quarried in Indiana and Ohio and from schist quarried in Vermont; and rubbing stones from sandstone quarried in Indiana and Ohio.

Oilstones and other whetstones, hones, scythestones, and rubbing stones sold by producers in the United States, 1921–1930

Year	Short tons	Value	Year	Short tons	Value
1921	831	$173, 025	1926	1, 680	$223, 359
1922	1, 016	197, 450	1927	1, 048	233, 545
1923	1, 223	231, 812	1928	956	228, 245
1924	1, 056	258, 943	1929	838	212, 017
1925	970	272, 224	1930	651	137, 184

The manufacturers of oilstones and other whetstones, scythestones, and rubbing stones from natural stone in 1930 and the sources of their raw materials were as follows:

- The American Rubbing Stone Co., Cincinnati, Ohio: Whetstones and rubbing stones; manufactured from sandstone quarried at Floyds Knobs, Floyd County, Ind.
- J. A. Chaillaux, West Baden, Ind.: Scythestones; manufactured from sandstone quarried at McDermott, Scioto County, Ohio. Stone also sold to other companies for the manufacture of whetstones.
- The Cleveland Quarries Co., Cleveland, Ohio: Scythestones, lathe stones, and holystones; manufactured from stone obtained at Berea, Cuyahoga County, and Amherst, Lorain County, Ohio.
- Garland Whetstone & Realty Co., Hot Springs, Ark.: Produces rough stone, in Garland County, for oilstones, some of which is shipped abroad and some sold to manufacturers in this country.
- Pike Manufacturing Co., Pike, N. H.:
  - Oilstones; manufactured from novaculite obtained from quarries near Hot Springs, Garland County, Ark.
  - Whetstones; manufactured from sandstone obtained from quarries near West Baden, Orange County, Ind., and McDermott, Scioto County, Ohio.
  - Scythestones; manufactured from schist quarried at Barton, Orleans County, Vt.

CORUNDUM AND EMERY

Corundum, the natural aluminum oxide (Al_2O_3), is a mineral exceeded in hardness only by the diamond. The purest form of corundum has excellent abrasive qualities. In the past it has been used extensively as an abrasive but recently has been supplanted almost entirely by the artificial aluminum oxide abrasives. Production in the United States was reported for 1906 and a number of preceding years and again in 1917 and 1918, but no production has been reported since 1918.

Emery is simply a mixture of corundum and magnetite. The best varieties consist of 50 to 60 per cent of corundum and 40 to 50 per cent of magnetite; the more impure varieties contain various amounts of spinel, hematite, and other minerals; the corundum is the important abrading agent. Emery is used principally in the metal trades where, however, it is being replaced by artificial abrasives to a great extent. The best foreign emery is obtained from the Greek island Naxos. Greece and Turkey are the chief sources of foreign supply.

Emery sold or used by producers in the United States, 1921–1930

Year	Short tons	Value	Year	Short tons	Value
1921	305	$2,250	1926	386	$3,641
1922	1,468	17,511	1927	506	5,855
1923	2,286	29,478	1928	1,341	16,787
1924	2,195	19,756	1929	924	10,722
1925	769	5,907	1930	555	5,996

The companies reporting sales of emery in the United States in 1930, with the locations of the deposits from which the material was obtained, were as follows:

NEW YORK

Westchester County:
  Peekskill (near)—
    Keystone Emery Mills (address, 4329 Paul Street, Frankford, Philadelphia, Pa.).
    Smith & Ellis (address, Peekskill).

GARNET

Garnet is a complex silicate mineral or, more properly, a group of minerals varying somewhat in composition and properties. The iron-aluminum garnet almandite is the one most commonly used as an abrasive. Garnet is somewhat harder than quartz, and the nature of its fracture is such that the broken particles have enough flat surfaces to permit firm attachment to a paper backing and at the same time expose very efficient cutting edges. About 90 per cent of the garnet mined is used for the manufacture of abrasive papers and cloths which have a higher cutting efficiency than sandpaper. Powdered garnet is used for grinding purposes, particularly for the grinding of plate glass.

The chief production of garnet in the United States is from Warren County, N. Y. Merrimack County, N. H., has been second in importance in recent years. The garnet of the former locality occurs as crystals scattered throughout a granite gneiss and constitutes 4 to 8 per cent of the rock. The rock is quarried by open-pit methods, passed through crushers and rolls, and the garnet separated from the waste rock by jigs and tables.

In 1930 the sales of abrasive garnet by producers in the United States amounted to 5,003 short tons, valued at $314,129. The average value of garnet mined in 1930 was $63 a ton, as compared with $73 in 1929, $69 in 1928, and $83 in 1927.

Abrasive garnet sold or used by producers in the United States, 1921–1930

Year	Short tons	Value	Year	Short tons	Value
1921	3,048	$260,687	1926	6,397	$523,875
1922	7,054	566,879	1927	6,939	573,525
1923	9,006	688,437	1928	6,617	459,307
1924	8,290	674,176	1929	5,961	435,420
1925	8,429	712,853	1930	5,003	314,129

The companies producing garnet in the United States in 1930, with the locations of the deposits from which the garnet was obtained, were as follows:

NEW HAMPSHIRE

Merrimack County:
  Danbury—Ford Motor Co. (address, Dearborn, Mich.).
  South Danbury—Garnet Products Co.

NEW YORK

Warren County:
  North Creek—Barton Mines Corporation.
  Riparius (Johnsburg)—Warren County Garnet Mills (address, 149 Orange Street, Newark, N. J.).

TRIPOLI

Tripoli is an extremely fine-grained porous form of silica of the chalcedony variety. Some authorities believe that it was formed by decomposition of siliceous limestones, but others question this mode of origin. Most of the tripoli mined is applied to uses other than abrasive. Its most important abrasive use is as a constituent of buffing compounds. It is also used in metal pastes and polishes and in rubs and polishes for paint and lacquer finishes. It is a constituent of various scrubbing and scouring powders and soaps and is said to have superior qualities for cleaning tile floors, woodwork, and kitchen appliances.

Rottenstone is a material related to tripoli but is somewhat more earthy and less siliceous. It is usually regarded as residual matter from the natural decomposition of argillaceous rocks or of impure limestone. It is produced in Lycoming County, Pa., and it is imported from Europe. In Europe it is mined in Derbyshire (England), in Wales, and in Belgium and is used more extensively there than in America. In England it is used as one of the abrasive bases in pastes and liquid metal polishes. In America it is used as a mild abrasive in wood and metal finishing, as, for example, in the scouring of metal surfaces prior to plating.

The value of tripoli (including Pennsylvania "rottenstone") sold in 1930, as reported by producers, was $507,505. This value corresponds approximately to 32,000 short tons of material, of which a small proportion was sold in the form of crude quarry products. Most of the production, however, was sold in ground or otherwise prepared form by the producers at values ranging from $12 to $24 a ton.

The chief sources of production in 1930, as in previous years, were a small area lying in Newton County, Mo., and Ottawa County, Okla., and the Alexander-Union County area in southern Illinois; an appreciable output was also reported from Arkansas and Tennessee, and a smaller output was reported from Georgia. The output of rottenstone in Lycoming County, Pa., is also included in the figures here presented.

Tripoli from the Missouri-Oklahoma district is used extensively for abrasive purposes, in scouring and polishing powders, and in polishing compositions and pastes. An important use is for foundry partings.

A promising new market outlet is being developed in concrete construction. Properly prepared tripoli used as an admixture is said to give greater workability and to decrease laitance of the mix, as well as to insure a higher degree of water-tightness, added strength, decreased shrinkage, diminished efflorescence, and greater durability of the final concrete.

The market for filter blocks has declined somewhat during recent years because of gradual improvements in municipal water systems; however, tripoli is still so used in many smaller isolated communities, and a considerable quantity is exported each year. Other uses are as a filler in hard rubber and substitute compositions and as a pouncing powder for tracing cloth. Tripoli has been suggested for use as a washing powder for laundries and as a dry-cleaning agent, but merchandising difficulties appear to hinder extensive development of these markets.

The Illinois product is generally known simply as "silica," and although employed to some extent as an abrasive for metal polishes, in soaps, and in cleansers it is very largely used in paint and fillers, in making glass, in the body and enamel of ceramic wares, and for facing foundry molds.

It is not possible to determine the amounts of tripoli used as abrasive material and otherwise or to obtain from the producers uniform reports on the quantity and value of the crude or rough quarried material, as they sell much of the product originally in some manufactured or prepared form. Statistics reported in this chapter and in earlier chapters of Mineral Resources therefore do not permit satisfactory comparison between years or between producing States. In the following table the value for the total output of crude tripoli is in part an arbitrarily assigned value, inasmuch as a large part of the output is not sold crude but in ground or other prepared form by the original producers. The values given "as sold" are the total realizations as reported by producers and include receipts from sales of both crude and ground or otherwise finished material.

Tripoli (including Pennsylvania "rottenstone") sold or used by producers in the United States, 1921-1930

Year	Illinois			Other States[1]			Total		
		Value			Value			Value	
	Short tons	Crude (estimated)	As sold (crude and finished)	Short tons	Crude (estimated)	As sold (crude and finished)	Short tons	Crude (estimated)	As sold (crude and finished)
1921	7,765	$27,333	$125,352	4,575	$26,559	$87,661	12,340	$53,892	$213,013
1922	18,747	54,741	194,371	11,458	50,568	122,357	30,205	105,309	316,728
1923	11,522	31,230	117,201	15,560	30,960	265,556	27,082	62,190	382,757
1924	13,466	23,566	116,188	15,010	31,971	273,221	28,476	55,537	389,409
1925	11,809	27,480	143,859	17,579	31,290	291,027	29,388	58,770	434,886
1926	11,948	29,870	192,483	19,421	35,152	331,126	31,369	65,022	523,609
1927	(2)	(2)	(2)	(2)	(2)	(2)	26,099	66,452	447,068
1928	(2)	(2)	(2)	(2)	(2)	(2)	34,043	73,689	555,576
1929	12,889	27,597	139,557	25,122	46,878	406,101	38,011	74,475	545,658
1930	9,954	22,813	116,307	22,485	48,977	391,198	32,439	71,790	507,505

[1] 1921-1923: Missouri, Oklahoma, and Pennsylvania; 1924-1928: Missouri, Oklahoma, Pennsylvania, and Tennessee; 1929: Arkansas, Missouri, Oklahoma, Pennsylvania, and Tennessee; 1930: Arkansas, Georgia, Missouri, Oklahoma, Pennsylvania, and Tennessee.

[2] Bureau of Mines not at liberty to publish figures.

The companies producing tripoli (including Pennsylvania "rottenstone") in the United States in 1930, with the locations of the deposits from which the material was obtained, were as follows:

ARKANSAS

Benton County: Rogers—Corona Silica (Inc.).

GEORGIA

Floyd County: Rome—American Minerals Corporation (address, 206 Bank Street, Burlington, Vt.).
Walker County: La Fayette—American Minerals Corporation (address, 206 Bank Street, Burlington, Vt.).

ILLINOIS

Alexander County:
    Elco—International Silica Co. (address, Cairo).
    Olive Branch—Olive Branch Mineral Products Co.
    Tamms (near)—American Minerals Corporation (address, 206 Bank Street, Burlington, Vt.).
Union County:
    Millcreek—
        C. H. Hileman (address, R. D. 1, Box 65, Jonesboro).
        Miller & Allen (address, Elco).

MISSOURI

Newton County:
    Racine—Independent Gravel Co. (address, 220½ West Fourth Street, Joplin).
    Seneca—American Tripoli Co.

OKLAHOMA

Ottawa County: Seneca, Mo. (near)—American Tripoli Co. (address, Seneca, Mo.).

PENNSYLVANIA

Lycoming County: Antes Fort—Penn Keystone Co. (address, 10 East Fourth Street, New York, N. Y.).

TENNESSEE

Bradley County: Cleveland (near)—American Minerals Corporation (address, 206 Bank Street, Burlington, Vt.).

Wayne County: Waynesboro—C. C. Houston & J. W. Young (address, Lewisburg).

DIATOMITE

Diatomite (known also as diatomaceous earth, infusorial earth, and kieselguhr) is a fine-grained hydrous or opaline fossil form of silica. Deposits consist chiefly of the skeletal remains of minute water plants known as diatoms. These plants secrete silica from the water in which they live; their skeletons accumulate, eventually becoming more or less consolidated. Deposits may be either of marine or fresh water origin. The organic structure of the particles is plainly visible by using a microscope of high magnification, affording a definite and simple means of identification. Diatomite can thus be distinguished from tripoli, which shows no organic structure.

The economic importance of diatomite depends mainly upon its unusual physical properties—fineness and uniformity of texture, light weight, high porosity, and relative chemical inertness. Dry lump material weighs about 28 pounds a cubic foot. Dry, loose powder usually ranges in weight from 7 to 16 pounds a cubic foot, depending upon the character of material and type of deposit. Diatomite can absorb one and one-half to two times its weight of water. Because of its organic structure and high porosity diatomite contains innumerable small chambers, the character of which is extremely important for many uses.

The chief use of diatomite is not as an abrasive, but mainly as a filtering and clarifying agent, an insulating medium, a filler, an admixture in concrete, and an absorbent. As an insulator it may be used as cut or sawed brick or as prepared brick. As a filtering agent it is used widely in the process of refining sugar. As an admixture to concrete it is said to give added plasticity and to retard segregation of the mix when hauled by truck or other means. During the past few years diatomite has been used to an increasing extent as a filler in the manufacture of battery boxes. The annual quantity now being so used is conservatively estimated at 15,000 tons. Material for this market outlet must be very low in acid-soluble substances, iron, manganese, and other foreign material.

To a limited extent diatomite is used as an abrasive for polishing metals, glass, furniture, and enamel, and in cosmetics. Its value as a polishing agent depends upon hardness, fineness, uniformity of grain size, and the character of the individual diatoms. Certain fresh-water varieties are said to have superior cutting qualities, because many such particles are relatively smaller, harder, or sharper. Diatomite has value as a cleanser not only because of its abrasive qualities but also because of its ability readily to absorb grease, coloring matter, and other impurities.

As with many other nonmetallic minerals markets for diatomite are changing constantly; certain new uses are being developed while others are being abandoned. In addition to the use of diatomite as a filler in asphalt or hard-rubber and composition goods a promising field for the future is in connection with the manufacture of lightweight building material. Considerable success has been achieved in Europe in the development of lightweight building units using diatomite, lime, and sawdust as essential ingredients. These products are being used successfully for partitions and flooring slabs for office buildings and other structures. Advantages that are claimed for such products are: (1) A saving in dead load resulting in greater economy; (2) efficient heat and sound insulating qualities; (3) a saving in cost of construction because such units can be sawed and nailed easily; and (4) fire-resistant qualities. This utilization will doubtless have eventual importance to domestic producers.

In 1930, as usual, the chief source of production of diatomite was California; sales were also reported from Oregon, Washington, Nevada, Virginia, New York, and Idaho.

Diatomite sold or used by producers in the United States, 1921–1930 [1]

Year	Short tons	Value	Year	Short tons	Value
1921	[2] 55,134	[2] $682,616	1925	73,030	$922,281
1922	44,761	386,669	1926	[2] 87,126	[2] 1,081,564
1923	65,833	699,406	1927–1930	(1)	(1)
1924	63,163	693,917			

[1] Bureau of Mines not at liberty to publish figures for years beginning 1927.
[2] Partly estimated.

The companies producing diatomite in the United States in 1930, with the locations of the deposits from which the diatomite was obtained, were as follows:

CALIFORNIA

Fresno County: Mendota—Mineral Products Manufacturing Co. (address, 1735 Ventura Avenue, Fresno).
Los Angeles County: Walteria—Dicalite Co. (address, 756 South Broadway, Los Angeles).
Monterey County:
  Bradley (near)—Pacatome (Ltd.) (address, 814 Kohl Building, San Francisco).
  Monterey—The Calatom Co. (Inc.).
Santa Barbara County:
  Lompoc—
    Celite Corporation.
    National Silica Products Co. (address, 63 Bluxome Street, San Francisco).

IDAHO

Gooding County: Gooding—George H. Chaffin (address, 216 East Fourth South, Provo, Utah).

NEVADA

Elco County: Carlin—Tri-o-lite Products Co.
Esmeralda County: Basalt (near)—Filtering Clay Products (Ltd.) (lessee of U. S. Diatom Co.) (address, 1102 Signal Oil Building, 811 West Seventh Street, Los Angeles, Calif.).
Storey County: Virginia City—The Electro-Silicon Co. (address, 22 Cliff Street, New York, N. Y.).

NEW YORK

Herkimer County: Poland—Adirondack Diatomaceous Earth Co. (address, Herkimer).

OREGON

Deschutes County: Terrebonne—Atomite Corporation (address, 1021 Pacific Building, Portland).
Malheur County: Harper—Whiteurth Products Corporation.

VIRGINIA

Westmoreland County: Oak Grove—American Diatom Co. (address, 618 Witherspoon Building, Philadelphia, Pa.).

WASHINGTON

Grant County: Quincy—E. J. Webley.
Kittitas County: Kittitas—Kittitas Diatomite Co. (address, Ellensburg).

PUMICE AND PUMICITE

Pumice and pumicite are siliceous volcanic substances quite similar in chemical composition but somewhat different in manner of formation and mode of occurrence. Pumice usually occurs near active or extinct volcanoes in solid coherent masses; some deposits, however, are fragmental in character. The color is generally white to light gray. Pumice is formed by sudden expansion of included gases in molten lava, followed by relatively quick cooling. It thus contains innumerable vesicules or chambers separated by thin glasslike walls. Pumicite, known also as volcanic ash and volcanic dust, is composed of small, sharp, angular or platy particles of volcanic glass spumed from volcanoes during periods of violent eruptions and subsequently transported and deposited by air currents.

Lump pumice is used as an abrasive for polishing various metals; for rubbing down wood surfaces in the manufacture of high-grade furniture, such as pianos, phonographs, and radios; to a limited extent in the automobile industry; and for working, cleaning, and polishing stone and glass. Fine lump pumice is used as a toilet article. Ground pumice is used in the electroplating industry; in tumbling barrels; in cleansing, scouring, and polishing compounds; in dental preparations; and as an abrasive in rubber erasers. Pumice is used in construction as a lightweight concrete aggregate, in the manufacture of bricks and other building units, and as an ingredient in acoustic plasters. It is also used as a heat and sound insulating medium.

Pumicite is used in making cleansing and scouring compounds, abrasive hand soaps, and, to a limited extent, metal polishes. It is used in construction as an admixture in concrete and to a lesser extent as an insulating material for packing steam and water pipes, lagging boilers, lining cold-storage rooms, in filter cells, and as a filler in paints and sweeping compounds.

Production of pumice and pumicite in the United States in 1930 was reported from Yuma County, Ariz.; from Fresno, Imperial, Inyo, Kern, Mono, San Bernardino, and San Luis Obispo Counties, Calif.; from Grant, Meade, and Norton Counties, Kans.; from Frontier County, Nebr.; and from Tripp County, S. Dak. In California the output was partly lump pumice. Kansas and Nebraska produced only pumicite or volcanic dust. The total quantity of pumice and pumicite sold or used by producers in 1930 was 56,843 short tons, valued at $336,099.

The Kalite Co. (Ltd.) leased the deposits of A. W. Brand in Imperial County, Calif., July 1, 1930, and used the material which it mined in the manufacture of Kalite acoustic plaster.

The mines of W. A. T. Agard (address, 2022 Woolsey Street, Berkeley, Calif.), near Klamath Falls, Klamath County, Oreg., from which a small output of both lump and screened pumice was reported in 1929, were shut down during 1930 pending new equipment, only a small quantity being shipped for samples.

Deposits of pumicite were worked in 1930 near Winner, Tripp County, S. Dak., by the Klenit Corporation; the product was used in the manufacture of soap.

Pumice and pumicite sold or used by producers in the United States, 1921–1930

Year	Short tons	Value	Year	Short tons	Value
1921	37,108	$158,540	1926	53,887	$208,504
1922	45,262	175,600	1927	53,298	221,481
1923	56,575	214,169	1928	57,430	278,516
1924	43,651	190,253	1929	[1] 67,013	[1] 353,064
1925	40,380	179,020	1930	56,843	336,099

[1] Revised figures.

The companies producing pumice and pumicite in the United States in 1930, with the locations of the deposits from which the pumice and pumicite were obtained, were as follows:

ARIZONA

Yuma County: Bouse—Yuma Products Manufacturing Co. (address, 3648 Humboldt Street, Denver, Colo.).

CALIFORNIA

Fresno County:
  Friant (near)—
    Earlonite Mining Co. (address, Box 474, Selma).
    The McKenzie Estate (address, Griffith-McKenzie Building, Fresno).
Imperial County:
  Calipatria (near)—
    A. W. Brand (address, 880 East Colorado Street, Pasadena).
    Kalite Co. (Ltd.) (address, 90 South Oak Knoll Avenue, Pasadena).
  Niland—Flynt Silica & Spar Co. (address, 1047 Richmond Street, Los Angeles).
Inyo County:
  Shoshone—
    Chas. Brown.
    California Talc Co. (address, 837 Jackson Street, Los Angeles).
    Tonopah & Tidewater Railway (address, 1014 Central Building, Los Angeles).
Kern County: Saltdale—Cudahy Packing Co. (address, 111 West Monroe Street, Chicago, Ill.).
Mono County: Laws (near)—California Quarries Corporation (address, 1300 Quinby Building, Los Angeles).
San Bernardino County: Daggett—Hill Brothers Chemical Co. (address, 2159 Bay Street, Los Angeles).
San Luis Obispo County: Paso Robles (near)—M. L. Francis (address, Creston, R. F. D.).

KANSAS

Grant County: Satanta (near)—H. H. Zimmerman (address, Adams).
Meade County:
  Fowler—
    Cudahy Packing Co. (address, 111 West Monroe Street, Chicago, Ill.).
    The Pumicite Co. (address, 4025 Clara Avenue, St. Louis, Mo.).
Norton County: Calvert—The Davidson Pumice Co. (address, Norton).

NEBRASKA

Frontier County: Eustis—La Rue Axtell Pumice Co.

SOUTH DAKOTA

Tripp County: Winner—Klenit Corporation.

PEBBLES FOR GRINDING AND FLINT LINING FOR TUBE MILLS

The commercial production of pebbles used for grinding minerals, ores, cement, and for other purposes, together with the output of quartzite blocks for use as tube-mill liners, includes, so far as known to the Bureau of Mines, only the output of beach pebbles in southern California and of cut cubes and cut liners made of quartzite in Minnesota. The figures in the following table appear to cover the entire commercial output, but doubtless there was unrecorded additional production for local or own use by other companies than those reporting.

Pebbles for grinding and flint lining for tube mills sold or used by producers in the United States, 1921–1930

Year	Short tons	Value	Year	Short tons	Value
1921	989	$14,637	1926	6,219	$85,146
1922	3,159	30,798	1927	3,342	46,856
1923	4,551	51,795	1928	6,288	89,321
1924	2,532	37,429	1929	4,630	66,178
1925	3,831	50,147	1930	3,480	50,816

ABRASIVE DIAMONDS

Abrasive diamonds, or industrial diamonds as they are commonly called, are of two types—the black diamond, or carbonado, and bort. The black diamond is the hardest known substance, the claim being made that it is 3 per cent harder than the gem diamond. It is lacking in cleavage, is opaque, and resembles a piece of lava or coal. Black diamonds are found chiefly and almost exclusively in the State of Bahia in the interior of Brazil. The second variety (bort) consists of cull stones from the gem-diamond industry, most of which are obtained from South Africa. Unlike the black diamond, bort has a distinct cleavage. Although the diamond is extremely hard it is also brittle and is easily shattered if subjected to a sudden shock or blow.

Industrial diamonds are widely used in drill bits for rock drilling and boring. The usual procedure is to set 6 to 10 diamonds in the lower face of a hollow cylinder of soft annealed steel. By rotation the bit cuts out a cylindrical core of rock. Black diamonds are used chiefly for this work, although bits using bort have been developed for certain purposes. Such bits may have as many as 56 small diamonds set in the cutting face.

Diamonds cut more quickly, are more durable, and can finish material with greater precision than steel; diamond tools, therefore, are especially adapted for the production of large numbers of pieces of exact and uniform sizes. Diamond saws are used extensively for sawing rock, such as marble and limestone. The diamonds are mounted in detachable steel sockets at regular intervals around the rim of circular saws or along the edge of specially constructed drag and gang saws. The individual teeth are made by casting a special steel alloy around the diamonds, which are suspended in the molds by wires. Bort diamonds set and held in special tools are used widely for truing abrasive wheels, for cutting or machining hard rubber, rubber composition, paper rolls, bakelite, fiber, papier mâché, ivory, graphite, mica, brass, bronze, aluminum, and other metals, and also for grinding cylinder walls. Perforated diamonds are used as dies through which to draw fine wire to accurate and uniform cross section. Although this use has decreased somewhat because of the substitution of special alloys small diamond dies are still widely used, especially in connection with the radio industry. Small diamonds are used in many kinds of glaziers' tools. Fragments of bort are pulverized into diamond dust, which is used for cutting and polishing precious stones, as an abrasive for drilling diamonds to make diamond dies, and in sawing porcelain and similarly hard materials.

Depressed world trade during 1930 had its effect upon the diamond industry, although prices as a whole remained fairly firm, due principally to the efforts of the Diamond Syndicate and to the close relationship existing and maintained among the producers, manufacturers, and distributors.

Relatively few diamonds have been produced in the United States. During 1930, however, the Arkansas Diamond Corporation, Little Rock, Ark., recovered a number of gem and bort stones in the course of exploration work upon its holdings.

Imports of diamonds are shown on pages 166 and 167. It will be noted that the value of dust and bort imported decreased from $760,476 in 1925 to $31,222 in 1928 but increased to $90,945 in 1930. Imports of uncut diamonds for use by glaziers, engravers, and miners reached a maximum value of $4,067,674 in 1929 but decreased in 1930 to $2,756,630, virtually the same value as that of the 1928 imports.

ABRASIVE SAND

Abrasive sand is used extensively in sawing and rubbing stone, such as granite, limestone, marble, slate, and soapstone. Both gang saws and wire saws employ sand as a cutting medium. Such sand generally needs little preparation except screening to remove oversize particles, sticks, and other rubbish; consequently, it is a relatively low-priced commodity. In gang saws thin strips of steel held in suitable frames pass back and forth on the stone block while a stream of water and sand is constantly fed into the cuts. With the wire saw the principle is the same, except that a long endless traveling wire is used instead of steel bands. The surface of sawed stone slabs may be smoothed and trued by holding the blocks stationary on revolving circular tables or rubbing-beds, which are covered with a film of sand and water.

"Chats" (tailings from the Joplin (Mo.) lead-zinc district) are used to some extent in the Indiana limestone district as a substitute for sand. The particles, being mostly ground chert, are very angular and sharp and produce a surface desirable for certain types of work.

Abrasive sand is used widely for removing surface inequalities in crude-rolled plate glass before later grinding and polishing processes. Two or three tons of sand are required to grind 1 ton of plate glass. Carefully graded sand used for the second stage of grinding and for beveling glass has been displaced largely by artificial abrasives.

Sand propelled by compressed air has a terrific abrading action and is so used to remove inequalities from rough castings, to clean paint from old surfaces, to clean or renovate stone and brickwork, to cut glass, to prepare the surfaces of metal for electroplating or enameling, and to carve and engrave designs and inscriptions on monuments.

The production of abrasive sand was 1,115,915 short tons, valued at $1,613,022 in 1930 as compared with 1,636,464 tons, valued at $2,303,652, in 1929. Statistics for earlier years appear in the various Mineral Resources chapters on Sand and Gravel. Most, if not all, of such material is silica sand derived from weathered sandstone or won from deposits of sand and gravel in beaches, rivers, or glacial drift. Much of it is by-product material from the production of glass, molding, building, and paving sands. Abrasive sand does not include pulverized quartz or other forms of silica reduced by intensive grinding.

MISCELLANEOUS ABRASIVE MATERIALS

River silt is used to a limited extent in cleansing powders and in the manufacture of bath bricks. Clays are used as mild abrasives in some polishes and cleansing soaps. Highly burned clays are sometimes ground to dust and used in metal polish. Talc is used for polishing peanuts and rice. Very pure high-grade lime is used for polishing surgical instruments and cutlery. Chalk is used as a mild abrasive for polishing plated ware. Feldspar is used in some window-cleaning compounds; as it is softer than quartz it is less liable to scratch glass than compounds containing some form of free silica.

IMPORTS AND EXPORTS

Value of abrasive materials imported for consumption in the United States, 1925–1930

Material	1925	1926	1927	1928	1929	1930
Millstones and burrstones	$8,413	$6,266	$12,726	$6,354	$6,564	$7,050
Grindstones	124,319	120,335	134,804	114,874	119,264	66,677
Hones, oilstones, and whetstones	49,108	63,152	67,368	45,303	48,207	40,612
Emery and corundum	313,718	616,700	264,613	272,533	494,174	329,752
Garnet	200	----------	----------	115	----------	----------
Diatomaceous earth, tripoli, and rottenstone [1]	6,589	14,544	15,403	21,883	23,183	46,478
Pumice	130,460	129,449	124,074	159,430	143,944	94,387
Diamond:						
Dust and bort	760,476	271,382	62,045	31,222	89,363	90,945
Glaziers' and engravers', unset, and miners'	1,976,640	1,939,735	2,148,275	2,756,895	4,067,674	2,756,630
Flint, flints, and flint stones, unground	105,041	120,078	93,658	144,313	127,457	62,463

[1] Beginning June 18, 1930, classification reads "Tripoli and rottenstone."

Abrasive materials imported for consumption in the United States, 1929 and 1930, by kinds

Kind	1929		1930	
	Quantity	Value	Quantity	Value
Millstones and burrstones:				
Rough or unmanufactured ---- short tons--	97	$6, 564	73	$4, 974
Bound up into millstones ---- do----	----------	----------	21	2, 076
Grindstones, finished or unfinished ---- do----	1, 882	119, 264	857	66, 677
Hones, oilstones, and whetstones ---- do----	305	48, 207	170	40, 612
Emery:				
Ore ---- do----	6, 403	100, 844	4, 252	64, 217
Grains, ground, pulverized, or refined ---- pounds--	(1)	(1)	(1)	(1)
Paper and cloth of emery or corundum ---- do----	(2)	43, 440	(2)	27, 278
Wheels, files, and other manufactures of which emery or corundum is the material of chief value ---- pounds--	292, 982	99, 830	71, 694	38, 476
Corundum (see also "Emery"):				
Ore ---- short tons--	3, 783	200, 739	3, 017	160, 559
Grains, ground, pulverized, or refined ---- pounds--	[1] 871, 549	[1] 49, 321	[1] 598, 788	[1] 39, 222
Diatomaceous earth, tripoli, and rottenstone [3] ---- short tons--	3, 260	23, 183	5, 441	46, 478
Pumice:				
Crude or unmanufactured ---- do----	9, 669	95, 774	5, 387	64, 326
Manufactures of, or of which pumice is the component material of chief value ---- short tons--	(4)	48, 170	(4)	30, 061
Diamond:				
Bort ---- carats--	4, 567	73, 200	5, 119	86, 036
Dust ---- pounds--	(4)	16, 163	(4)	4, 909
Glaziers' and engravers', unset, and miners' ---- carats--	46, 949	4, 067, 674	145, 862	2, 756, 630
Flint, flints, and flint stones, unground ---- short tons--	14, 097	127, 457	6, 856	62, 463
	----------	5, 119, 830	----------	3, 494, 994

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[1] Emery included with corundum; not separately classified.

[2] 10,273 reams in 1929 and 5,143 reams in 1930; weight not recorded.

[3] Beginning June 18, 1930, classification reads "Tripoli and rottenstone."

[4] Quantity not recorded.

Value of domestic abrasive materials exported from the United States, 1925–1930

Material	1925	1926	1927	1928	1929	1930
Grindstones ----	$553, 750	$629, 748	$578, 113	$560, 975	$391, 239	$246, 512
Abrasive wheels, emery and other ----	439, 904	248, 631	240, 027	254, 493	286, 360	203, 371
All other natural abrasives, hones, whetstones, etc ----	195, 915	323, 447	419, 088	453, 055	423, 363	361, 055

ARTIFICIAL ABRASIVES

Artificial abrasives fall chiefly into three main groups: (1) Metallic abrasives, such as crushed steel, steel shot, and steel wool; (2) silicon carbide abrasives, such as carborundum, crystolon, and carbolon; and (3) aluminum oxide abrasives, such as alundum, aloxite, exolon, and lionite. The metallic abrasives are used chiefly in loose form as cutting agents in sawing or drilling rock and other hard materials. A very important use of the silicon carbide and the aluminum oxide abrasives is in the manufacture of bonded abrasive wheels. The abrasive grains graded into uniform sizes are bonded together into wheels of varying degrees of coarseness and hardness. A fusible clay is used as the bonding material in vitrified grinding wheels. Sodium silicate, shellac, rubber, and bakelite are also employed as bonding materials. Much progress has been made in recent years in the development of highly efficient abrasive wheels; they are being used more and more as substitutes for natural abrasive products, such as emery wheels, grindstones, and pulpstones.

An artificial abrasive consisting of tin oxide or a mixture of tin oxide and oxalic acid has been termed "putty powder." It is used for polishing marble and granite. Rouge and crocus, both of which are forms of ferric oxide, are employed to produce a high luster—the former on precious metals and the latter on tin and cutlery. Rouge is used also for final polishing of plate glass. Chromium oxide, manganese dioxide, and magnesia have limited use as abrasives.

The table that follows gives the production of silicon carbide, aluminum oxide, and steel shot or crushed steel grains. These materials compete with the natural abrasives used as grains—for example, emery, corundum, and garnet. The figures represent the total output of crude materials or first product of the manufacturing plants, not all of which is used as abrasive material; in fact, a large but undetermined part of the silicon carbide and aluminum oxide output is not so used. The total output is shown here without separation of the products according to the uses to which they are put, because it is thought that the proportion used as abrasive material has not fluctuated so widely in recent years as to destroy the value of these figures for comparison with the statistics of natural abrasives.

Crude artificial abrasives sold, shipped, or used, from manufacturing plants in the United States and Canada, 1921–1930

Year	Silicon carbide		Aluminum oxide		Metallic abrasives		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1921	2,707	$475,336	7,325	$1,318,771	3,167	$202,040	13,199	$1,996,147
1922	16,233	2,022,613	31,898	3,246,714	5,804	421,148	53,935	5,690,475
1923	21,149	2,786,929	51,391	5,378,926	8,229	612,140	80,769	8,777,995
1924	17,792	2,161,498	33,708	3,482,577	8,597	569,665	60,097	6,213,740
1925	24,112	2,493,756	53,253	4,714,562	11,165	780,612	88,530	7,988,930
1926	17,026	1,702,037	43,967	4,106,699	12,610	942,429	73,603	6,751,165
1927	26,289	2,603,571	50,973	4,516,637	13,364	839,683	90,626	7,959,891
1928	22,162	2,286,518	59,103	5,640,901	18,466	904,629	99,731	8,832,048
1929	30,309	3,060,401	72,614	6,471,373	23,789	1,289,922	126,712	10,821,696
1930	22,008	2,047,188	46,465	4,067,148	16,428	977,037	84,901	7,091,373

BIBLIOGRAPHY

Some of the more important publications dealing with natural abrasive subjects are listed below.

Bayley, W. S. Nonmetallic mineral products. New York, 1930, pp. 337–355.

Bowles, Oliver. Sandstone quarrying in the United States. Bull. 124, Bureau of Mines, 1917, 143 pp.

Bowles, Oliver, and Lee, C. V. Feldspar. Inf. Circ. 6381, Bureau of Mines, 1930, 21 pp.

Calvert, Robert. Diatomaceous earth. New York, 1930, 251 pp.

Cole, L. Heber. Test of some Canadian sandstones to determine their suitability as pulpstones. Canada Dept. Mines, Mines Branch, Bull. 466, 1917, 17 pp.

——— Silica in Canada, its occurrence, exploitation and uses. Canada Dept. Mines, Mines Branch, Bull. 555, Part I, Eastern Canada, 1923, 126 pp. Bull. 686, Part II, Western Canada, 1928, 59 pp.

Eardley-Wilmot, V. L. Abrasives products of Canada, technology and application. Canada Dept. Mines, Mines Branch, Bull. 673, Part I, Siliceous abrasives. Bull. 675, Part II, Corundum and diamond. Bull. 677, Part III, Garnet, 1927. Bull. 699, Part IV, Artificial abrasives and manufactured abrasive products and their uses. 1929.

——— Diatomite, its occurrence, preparation and uses. Canada Dept. Mines, Mines Branch, Bull. 691, 1928, 182 pp.

——— Abrasives. Chapters in Mineral Industry. New York, 1926, 1927, 1928.

Gillson, Joseph L., and Kania, Joseph E. A. Genesis of the emery deposits near Peekskill, N. Y. Econ. Geol., vol. 35, August, 1930, pp. 506–527.

Griswold, L. S. Whetstones and novaculites. Geol. Survey of Arkansas Ann. Rept., vol. 3, 1892.

Haenig, A. Emery and the emery industry. (Translated by Chas. Salter.) London, 1912, 103 pp.

Hall, A. L. Corundum in the Northern and Eastern Transvaal. Union of South Africa, Dept. Mines and Industries, Memoir No. 15, 1920, 223 pp.

Hatmaker, Paul. Diatomite. Inf. Circ. 6391, Bureau of Mines, 1931, 20 pp.

Imperial Institute. The mineral industries of the British Empire and foreign countries, abrasives. London, 1929, 67 pp.

Ladoo, R. B. Nonmetallic minerals. New York, 1925, pp. 3–10.

Merrill, G. P. The nonmetallic minerals. 2d ed., New York, 1910, pp. 400–410.

Miser, H. D., and Purdue, A. H. Gravel deposits of the Caddo Gap and De Queen quadrangles, Arkansas. U. S. Geol. Survey Bull. 690, 1918, pp. 15–30.

Myers, W. M., and Anderson, C. O. Garnet, its mining, milling, and utilization. Bull. 256, Bureau of Mines, 1925, 54 pp.

Pratt, J. H. Corundum and its occurrence and distribution in the United States. U. S. Geol. Survey Bull. 269, 1906, 175 pp.

Thoenen, J. R. Economics of new sand and gravel developments. Econ. Paper 7, Bureau of Mines, 1929, 60 pp.

U. S. Tariff Commission. Tariff information survey B–3, abrasive materials, 1921, 46 pp.

Weigel, W. M. Technology and uses of silica and sand. Bull. 266, Bureau of Mines, 1927, 204 pp.

CLAY[1]

By JEFFERSON MIDDLETON and K. V. HERLIHY

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GENERAL CONDITIONS

The largest use for clay is in the manufacture of clay products. Clay for this purpose is widely distributed throughout the United States, and there are clay-working plants in every State. The tables of production that follow represent chiefly the clay that was mined and sold as clay, or mined under royalty or shipped into another State for fabrication; they do not include the clay that was burned into clay products by the producers themselves, unless it was mined under royalty or in a different State from that in which it was used. The quantity of clay thus sold is small compared with the total output and mainly includes clay used for making high-grade pottery and tile, paper, and refractory products. The values given for domestic production are f. o. b. mines or works; for imports, at the principal markets of the countries from which the clay was exported; and for exports, at the port of shipment.

TECHNICAL DEVELOPMENTS

During 1930 considerable interest was manifested in the purification of kaolin by air separation. Air purification of kaolin has been practiced in a more or less desultory way for many years, reference to the use of this method having been made as early as 1903.[2] The early separators appear to have been crude and inefficient. In recent years powerful dry centrifugal air separators have been employed with much success. According to a communication received by the Bureau of Mines, this process involves five steps, as follows:

1. Air drying.
2. Coarse crushing to reduce the lumps sufficiently to permit economical drying in a heated drier.
3. Drying sufficiently to drive off the free moisture to permit pulverizing.
4. Pulverizing sufficiently to liberate the grains of silica (which are usually discharged from the mill with some clay adhering to them) and the finely divided clay.
5. Separation by dry centrifugal air separator of the finely divided clay, rejecting the silica and other impurities.

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[1] Work on manuscript completed August, 1931.

[2] Ries, Heinrich, The Clays of the United States East of the Mississippi River: U. S. Geol. Survey Prof. Paper 11, 1903, p. 35.

This process is claimed to be much more efficient economically than any heretofore used.

TARIFF

The tariff act of 1930, effective June 18, contains the following provisions in regard to clay:

> PAR. 207. Clays or earths, unwrought and unmanufactured, including common blue clay and Gross-Almerode glass-pot clay, not specially provided for, $1 per [long] ton; wrought or manufactured, not specially provided for, $2 per ton; bentonite, unwrought and unmanufactured, $1.50 per ton; wrought or manufactured, $3.25 per ton; china clay or kaolin, $2.50 per ton; * * * clays or earths, artificially activated with acid or other material, one-fourth of 1 cent per pound and 30 per centum ad valorem.

There is no change under this act in the rate of duty on kaolin, or china clay, and Gross-Almerode glass-pot clay. A duty is specifically provided for bentonite; clays or earths artificially activated are also provided for specifically for the first time.

PRODUCTION

The domestic clay-mining industry was affected adversely by the general business depression prevalent throughout 1930. The full effect of the lessened demand is shown by the considerable decrease in output and value as compared with the preceding year. The total sales of clay in 1930 amounted to 3,962,903 short tons, valued at $12,521,495, a decrease of 9 per cent in quantity and 16 per cent in value as compared with 1929. Every kind of clay, as classified in this report, except "miscellaneous clay," showed decrease in both quantity and value.

In 1930 an effort was made for the first time to obtain figures showing the output of bentonite. The result of this canvass shows sales of 107,405 short tons, a quantity far in excess of the estimates heretofore made.

The sales of domestic kaolin, the chief clay used in the manufacture of high-grade ceramic wares, paper, etc., decreased 2 per cent in quantity and 10 per cent in value as compared with 1929. Imports of kaolin, or china clay, on the other hand, decreased 16 per cent in quantity as compared with 1929, and domestic mines furnished 68 per cent of the new supply in the United States as compared with 65 per cent in 1929. The sales of domestic kaolin in 1930 were nearly twice (1.9) as large as those in 1920. The Southern States continue to be the chief source of supply of domestic kaolin, reporting 81 per cent of the total in 1930; Georgia is the largest producer and reported 52 per cent of the total.

Ball clay, which is used principally with kaolin in high-grade ceramic wares, decreased 21 per cent in quantity and 25 per cent in value as compared with 1929.

Slip clay, a low-fusing material that formerly was used chiefly as a stoneware glaze, is used now chiefly as a binder in the manufacture of abrasives. In 1930 the sales of slip clay decreased 31 per cent in both quantity and value as compared with 1929. With the exception of 1922, the output in 1930 was the smallest since 1904. The sources of supply of slip clay in 1930, as in a number of years, were Michigan and New York.

Stoneware clay, the principal use of which is indicated by its name, decreased 13 per cent in quantity and 19 per cent in value as compared with 1929. The term "stoneware clay" is used rather loosely; much of this clay might with equal propriety be classed as fire clay.

Fire clay, which constituted 65 per cent of the total output of clay in 1930, decreased 608,197 tons, or 19 per cent, in quantity, and $2,012,031, or 25 per cent, in value, as compared with 1929. Although the 1930 sales were lower than those in any year beginning with 1926, they exceeded those in any year prior to 1926 and were 14 per cent greater than those in 1920. Except in 1920, the value of the fire clay sold in 1930 was higher than that in any year before 1923. The average value of fire clay per ton in 1930 was $2.37, as compared with $3.13 in 1920. As its name implies, the chief use of fire clay is in the refractories industries, more than two-thirds of the 1930 output having been reported as put to such uses. Considerable quantities are also used in the manufacture of high-grade ceramic wares, architectural terra cotta, and other heavy-clay products.

Miscellaneous clays include those used in many industries; the larger part of the output is used in the manufacture of heavy-clay products, such as building and drainage materials. Clay included under this head is also used for cosmetics, filtering oil (after chemical treatment), flower pots, foundries, modeling, rotary drilling, taxidermy, water-softening, and other purposes.

Clay sold by producers in the United States, 1921–1930, by kinds

Year	Kaolin or china clay and paper clay		Ball clay		Slip clay		Fire clay	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1921	162, 726	$1, 579, 163	54, 014	$354, 565	4, 608	$14, 841	1, 195, 861	$3, 560, 373
1922	275, 675	2, 346, 095	76, 792	440, 877	4, 050	19, 405	1, 679, 220	4, 633, 486
1923	336, 803	2, 926, 255	97, 068	620, 978	8, 520	43, 609	2, 298, 163	6, 565, 899
1924	326, 611	2, 923, 965	83, 034	581, 966	5, 910	31, 023	2, 443, 710	6, 737, 063
1925	367, 319	3, 220, 719	109, 607	699, 427	7, 349	37, 397	2, 566, 934	7, 312, 349
1926	432, 215	3, 771, 568	112, 195	867, 500	8, 644	45, 959	2, 819, 346	8, 119, 323
1927	454, 245	3, 809, 834	119, 763	913, 976	6, 137	32, 264	2, 699, 761	7, 719, 725
1928	496, 142	4, 088, 003	120, 878	984, 075	5, 699	30, 796	2, 785, 158	7, 480, 609
1929	518, 169	4, 281, 301	118, 190	987, 306	6, 369	38, 582	3, 178, 805	8, 107, 586
1930	510, 354	3, 868, 922	93, 488	739, 787	4, 398	26, 465	2, 570, 608	6, 095, 555

Year	Stoneware clay		Bentonite		Miscellaneous clay		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1921	86, 574	$184, 540	(1)	(1)	242, 963	$361, 818	1, 746, 746	$6, 055, 300
1922	86, 866	164, 870	(1)	(1)	525, 097	725, 781	2, 647, 700	8, 330, 514
1923	81, 389	194, 358	(1)	(1)	612, 717	837, 814	3, 434, 660	11, 188, 913
1924	59, 194	117, 142	(1)	(1)	772, 660	1, 116, 377	3, 691, 119	11, 507, 536
1925	77, 438	162, 161	(1)	(1)	901, 773	1, 304, 579	4, 030, 420	12, 736, 632
1926	84, 002	185, 288	(1)	(1)	510, 796	1, 115, 951	3, 967, 198	14, 105, 589
1927	98, 355	203, 648	(1)	(1)	470, 915	1, 017, 712	3. 849, 176	13, 697, 159
1928	95, 626	207, 275	(1)	(1)	522, 829	1, 409, 981	4, 026, 332	14, 200, 739
1929	87, 456	181, 901	(1)	(1)	438, 031	1, 254, 068	4, 347, 020	14, 850, 744
1930	75, 832	146, 513	107, 405	$858, 927	600, 818	785, 326	3, 962, 903	12, 521, 495

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[1] Sales of bentonite included under "Miscellaneous clay" prior to 1930 when separate figures first became available.

Clay sold by producers in the United States in 1929, by States and kinds

State	Number of operators reporting sales	Kaolin or china clay and paper clay		Ball clay		Fire clay		Stoneware clay		Miscellaneous clay [1]		Total	
		Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	12					106,568	$183,797			1,451	$1,343	108,019	$185,140
Arizona	1									(2)	(2)	(2)	(2)
Arkansas	2					574	2,883					574	2,883
California	40	1,086	$14,675	3,290	$14,070	180,809	440,272	1,504	$6,715	120,784	337,439	307,473	813,171
Colorado	18					128,426	180,888			33,582	34,521	162,008	215,409
Connecticut	2					301	5,134			215	645	516	5,779
Delaware	2	(2)	(2)									(2)	(2)
Florida	4	40,904	544,848									40,904	544,848
Georgia	15	274,825	2,084,219			13,665	14,672					288,490	2,098,891
Idaho	2					616	7,487					616	7,487
Illinois	22			(2)	(2)	235,219	479,974	23,548	37,188	(2)	(2)	264,332	553,797
Indiana	14					267,042	241,950			9,568	12,408	276,610	254,358
Iowa	6					3,193	23,141			7	140	3,200	23,281
Kentucky	20			52,808	480,697	100,810	312,402					153,618	793,099
Maine	3					130	2,870			40	82	170	2,952
Maryland	12			(2)	(2)	18,919	65,303			(2)	(2)	37,775	120,022
Massachusetts	8					328	8,809	34	323	11,429	16,585	11,791	25,717
Michigan	4									2,638	4,503	2,638	4,503
Minnesota	5					227	771	12,105	27,237	928	2,017	13,260	30,025
Mississippi	1							990	1,500			990	1,500
Missouri	32			1,630	14,552	490,069	1,770,896	6,000	12,000			497,699	1,797,448
Montana	4					6,488	11,313			12,632	12,632	19,120	23,945
Nebraska	6					200	700			16,809	19,174	17,009	19,874
Nevada	4	543	4,701							7,811	38,094	8,354	42,795
New Jersey	35			5,464	30,272	189,125	840,025	10,329	50,373	39,340	103,133	244,258	1,023,803
New Mexico	5					7,004	15,104			3,343	4,917	10,347	20,021
New York	8					498	7,452			7,657	38,101	8,155	45,553
North Carolina	2	17,678	282,672					5	10			17,683	282,682
North Dakota	1	9	212			19	57					28	269
Ohio	66					383,924	923,230	24,797	38,159	5,765	18,072	414,486	979,461
Oklahoma	1					31	153					31	153
Oregon	2					1,019	1,813	300	423			1,319	2,236
Pennsylvania	81	66,215	330,912			924,962	2,174,582	1,344	3,973	62,263	102,065	1,054,784	2,611,532
South Carolina	10	100,953	841,507			1,454	54,025			696	940	103,103	896,472
South Dakota	1									1,275	5,100	1,275	5,100
Tennessee	7			39,534	373,697	46,812	187,120			24,244	24,244	110,590	585,061
Texas	10					3,047	18,602			131	788	3,178	19,390
Utah	7	(2)	(2)			5,039	20,367			(2)	(2)	24,426	243,233
Vermont	1	1,550	11,890							1,089	4,783	2,639	16,673
Virginia	3	(2)	(2)			861	2,863			(2)	(2)	10,959	88,513
Washington	7					894	9,862	6,500	4,000	21,010	25,271	28,404	39,133

West Virginia	7					60, 530	99, 054					60, 530	99, 054
Wisconsin	1									500	500	500	500
Wyoming	7					2	15			22, 053	190, 156	22, 055	190, 171
Undistributed		14, 406	165, 665	15, 464	74, 018					37, 140	294, 997	13, 104	134, 810
	501	518, 169	4, 281, 301	118, 190	987, 306	[3] 3, 178, 805	[3] 8, 107, 586	87, 456	181, 901	[4] 444, 400	[4] 1, 292, 650	4, 347, 020	14, 850, 744
Average value per ton			8. 26		8. 35		2. 55		2. 08				3. 42

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[1] Includes ardmorite, bentonite, shale, etc. Slip clay is also included in this column as a matter of statistical convenience.

[2] Included under "Undistributed."

[3] These totals include 71,589 tons of diaspore and burley clay, valued at $378,398, from Missouri.

[4] These totals include 6,369 tons of slip clay, valued at $38,582, from Michigan and New York.

Clay sold by producers in the United States in 1930, by States and kinds

State	Number of operators reporting sales	Kaolin or china clay and paper clay		Ball clay		Fire clay		Stoneware clay		Miscellaneous clay [1]		Total	
		Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	8					86,698	$124,791					86,698	$124,791
Arizona	2									(2)	(2)	(2)	(2)
Arkansas	1					192	960					192	960
California	48	749	$7,711	283	$3,396	143,386	349,174	3,738	$10,796	379,102	$559,304	527,258	930,381
Colorado	16					87,791	106,927			20,371	21,415	108,162	128,342
Connecticut	3					227	3,763			381	798	608	4,561
Delaware	2	(2)	(2)									(2)	(2)
Florida	3	(2)	(2)									(2)	(2)
Georgia	16	266,434	2,036,317			23,446	24,892					289,880	2,061,209
Idaho	3					(2)	(2)			(2)	(2)	1,556	7,221
Illinois	19			105	2,625	162,711	328,877	18,753	30,024	2,986	10,119	184,555	371,645
Indiana	15					225,501	185,791			28,294	30,307	253,795	216,098
Iowa	8					3,956	39,466			2,263	2,350	6,219	41,816
Kentucky	19			39,782	374,502	164,050	392,751					203,832	767,253
Maine	3					(2)	(2)			(2)	(2)	175	1,785
Maryland	13	2,000	3,000	7,104	28,498	16,341	51,485			22,118	12,585	47,563	95,568
Massachusetts	8					(2)	(2)			(2)	(2)	9,109	12,911
Michigan	4									760	2,778	760	2,778
Minnesota	4					68	476	11,830	26,297	330	829	12,228	27,602
Missouri	33	(2)	(2)	2,777	25,000	405,880	1,233,287	(2)	(2)			412,827	1,275,787
Montana	3					1,114	5,705			6,120	5,348	7,234	11,053
Nebraska	5					248	1,830			12,896	12,696	13,144	14,526
Nevada	2	684	5,894							850	2,400	1,534	8,294
New Jersey	35			7,901	45,962	157,223	646,349	2,659	16,203	2,503	4,622	170,286	713,136
New Mexico	4					565	3,020			5,835	7,903	6,400	10,923
New York	9					504	7,688			4,687	25,770	5,191	33,458
North Carolina	4	24,674	391,432					31	31	54	108	24,759	391,571
North Dakota	2					10	202			349	355	359	557
Ohio	63					378,908	748,371	31,757	50,092	8,552	12,565	419,217	811,028
Oklahoma	2									(2)	(2)	(2)	(2)
Oregon	2					29	103	12	51			41	154
Pennsylvania	71	78,763	251,976			633,674	1,566,730	3,782	6,619	85,334	139,861	801,553	1,965,186
South Carolina	10	90,332	687,040			1,784	60,580					92,116	747,620
South Dakota	1									960	3,840	960	3,840
Tennessee	8			35,536	259,804	21,376	92,787			12,788	13,068	69,700	365,659
Texas	10					2,108	12,074			12,666	93,897	14,774	105,971
Utah	5					(2)	(2)			(2)	(2)	35,092	385,462
Vermont	1	12,221	66,490									12,221	66,490
Virginia	3	6,311	46,123			274	3,442			773	612	7,358	50,177
Washington	6					(2)	(2)	(2)	(2)	27,063	18,962	28,784	24,647
West Virginia						46,079	68,409					46,079	68,409

Wisconsin	1	------	------	------	------	------	------	------	------	140	240	140	240
Wyoming	7	------	------	------	------	4	32	------	------	25,006	249,765	25,010	249,797
Undistributed	------	28,186	372,939	------	------	6,461	35,593	3,270	6,400	49,440	438,221	35,534	422,589
	491	510,354	3,868,922	93,488	739,787	[3] 2,570,608	[3] 6,095,555	75,832	146,513	[4] 712,621	[4] 1,670,718	3,962,903	12,521,495
Average value per ton	------	------	7.58	------	7.91	------	2.37	------	1.93	------	------	------	3.16

[1] Includes adobe, ardmorite, shale, etc. Slip clay and bentonite are also included in this column as a matter of statistical convenience.

[2] Included under "Undistributed."

[3] These totals include 42,711 tons of diaspore and burley clay, valued at $224,722, from Missouri.

[4] These totals include 4,398 tons of slip clay, valued at $26,465, from Michigan and New York, and 107,405 tons of bentonite, valued at $858,927, from Arizona, California, Nevada, South Dakota, Utah, and Wyoming. Of the total for bentonite California reported 43,004 tons, valued at $187,644; Nevada, 850 tons, valued at $2,400; and Wyoming, 25,006 tons, valued at $249,765.

In 1930 operators in 43 States reported the sale of clay as such, a decrease of 1 State as compared with 1929. No operator in Mississippi, which has been a steady but small producer of clay, reported clay sold in 1930. The leading 10 States in order of output in 1930 were as follows: Pennsylvania (20.2 per cent of the total output of the United States), California (13.3 per cent), Ohio (10.6 per cent), Missouri (10.4 per cent), Georgia (7.3 per cent), Indiana (6.4 per cent), Kentucky (5.1 per cent), Illinois (4.7 per cent), New Jersey (4.3 per cent), and Colorado (2.7 per cent). These 10 States reported 85 per cent of the total in 1930; the first 5 of them reported 61.8 per cent of the total. Pennsylvania, Ohio, Georgia, and Indiana maintained the same ranks in 1930 as in 1929—first, third, fifth, and sixth. California rose from fourth in 1929 to second in 1930; Kentucky rose from tenth to seventh; and Missouri fell from second to fourth. In each of these leading 10 States except California and Georgia sales of fire clay in 1930 constituted more than three-fourths of the total sales and ranged from 79 per cent in Pennsylvania to 98 per cent in Missouri. Of the 43 States in which clay was sold in 1930, 17 reported increases in output and 9 reported increases in total value.

PRODUCTION BY USES

Statistics showing the production of clay by uses are necessarily incomplete, as many clay miners do not know the purpose to which their clay is put, but it is believed that the figures given in the following table are sufficiently complete to serve as a guide in the study of the uses of domestic clays. In considering these figures it should be borne in mind that they represent chiefly the clay sold as clay by the original producers and do not include the much greater quantities of clay that are burned into clay products by those who mine their own clay.

Clay sold by producers in the United States, 1929 and 1930, by uses, in short tons

Use	1929							1930							
	Kaolin	Ball clay	Slip clay	Fire clay	Stoneware clay	Miscellaneous clay	Total	Kaolin	Ball clay	Slip clay	Fire clay	Stoneware clay	Bentonite	Miscellaneous clay	Total
White-bodied ware made from white-burning clays	69, 468	66, 629		9, 829	881		146, 807	37, 223	54, 313		20, 446	2, 153		133	114, 268
Art pottery	3, 454	2, 256		316	450	275	6, 751	7, 997	3, 691		4, 805			64	16, 557
High-grade tile	21, 743	32, 330		17, 872	650	6, 072	78, 667	18, 732	11, 283		83, 306	4, 671		548	118, 540
Chemical stoneware		873		1, 669	7, 275		9, 817	170	9, 278		1, 444				10, 892
Stoneware		481		5, 479	58, 945	886	65, 791	132			1, 872	55, 542			57, 546
Enameling		536		57			593	6	191			10, 722			10, 919
Paper filler	235, 410			75			235, 485	244, 005			416				244, 421
Paper coating	33, 034						33, 034	34, 711							34, 711
Rubber	34, 296			1, 927			36, 223	29, 387			2, 517				31, 904
Oilcloth or linoleum	14, 648						14, 648	9, 542							9, 542
Paint filler or extender	13, 083	560				1, 152	14, 795	9, 176	422				60	590	10, 248
Paint pigment	180						180	560							560
Architectural terra cotta	100	8, 316		46, 635	12, 362	20, 314	87, 727	50	2, 638		47, 635	1, 650		2, 034	54, 007
Asbestos products	861	481		6, 740		30	8, 112	1, 173	500		2, 992				4, 665
Plaster and plaster products	5, 794			1, 572		50	7, 416	4, 862					60	600	5, 522
Slip for glazing purposes			1, 822				1, 822	164		1, 510					1, 674
Cement	42, 552			11, 043			53, 595	62, 542	718		532			4, 401	68, 193
Kalsomine	3, 436			261			3, 697	1, 921			1, 180				3, 101
Artificial abrasives	1, 000	49	4, 547	1, 298	853		7, 747	180	7	2, 888	452	162			3, 689
Crayons	489						489	296							296
Chemicals	126						126	60							60
Saggers	4, 283	1, 324		146, 291			151, 898	3, 484	2, 583		75, 919			337	82, 323
Pins, stilts, and spurs for potters' use	250	900		951			2, 101	225			1, 427				1, 652
Wads				35, 896			35, 896		7, 574		12, 940				20, 514
Fire brick and block	22, 873	502		1, 254, 115		4, 870	1, 282, 360	25, 890			1, 017, 000			879	1, 043, 769
Fire-clay mortar	2, 182	1, 242		403, 265		216	406, 905	1, 161			447, 812				448, 973
Bauxite and high alumina brick				3, 811			3, 811				4, 656				4, 656
Glasshouse pots	150			49, 108			49, 258	189			39, 877				40, 066
Glasshouse supplies, blocks, tiles, etc	190	1, 048		8, 983			10, 221	75			12, 142				12, 217
Zinc retorts and condensers				43, 034			43, 034				18, 174				18, 174
Clay crucibles	377			1, 907			2, 284	50			886				936
Graphite crucibles and stoppers		146					146								
Foundries, steel works, etc	6, 112			576, 254		37, 844	620, 210	4, 191			316, 741		15, 580	25, 793	362, 305
Unspecified [1]	2, 078	517		550, 417	6, 040	366, 322	925, 374	12, 200	290		455, 437	932	91, 705	565, 439	1, 126, 003
	518, 169	118, 190	6, 369	3, 178, 805	87, 456	438, 031	4, 347, 020	510, 354	93, 488	4, 398	2, 570, 608	75, 832	107, 405	600, 818	3, 962, 903

[1] 1929: Includes clay for building brick, casehardening, conduits, converters, cosmetics, daubing oven doors, drain tile, enameled brick, filtering or decolorizing oil, flowerpots, garden ornaments, high-temperature cement, hollow building tile, matches, modeling, packing hoofs of horses, roofing tile, sewer pipe, smelters, steel mills, stopping clay, taxidermy, toy marbles, wall plaster, water softener, and whiting. 1930: Includes clay for building brick, chimney tops, conduits, cosmetics, daubing oven doors, detergent, drain tile, enameled brick, filtering or decolorizing oil, flowerpots, flue lining, hollow building tile, luting, modeling, roofing tile, rotary drilling mud, sewer pipe, smelters, stopping clay, taxidermy, toy marbles, and water softener; also black-burning clay.

IMPORTS AND EXPORTS [3]

Clay imported for consumption in the United States, 1921–1930

Year	Kaolin or china clay		Common blue and Gross-Almerode glass-pot clay		All other clays				Total	
					Unwrought		Wrought			
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1921	162,906	$1,546,285	4,468	$77,217	41,421	$348,870	120	$2,313	208,915	$1,974,685
1922	310,136	2,963,420	7,323	84,415	40,624	327,388	2,566	29,398	360,649	3,404,621
1923	311,298	3,046,191	12,999	121,272	65,379	481,614	1,676	21,892	391,352	3,670,969
1924	353,124	3,188,454	7,059	62,883	82,562	706,018	1,322	18,685	444,067	3,976,040
1925	372,552	3,195,694	11,889	107,940	49,991	499,325	2,383	29,266	436,815	3,832,225
1926	396,219	3,484,054	6,608	60,391	84,512	672,223	2,331	31,243	489,670	4,247,911
1927	339,014	2,937,113	3,884	39,451	50,017	447,888	1,585	24,518	394,500	3,448,970
1928	307,304	2,962,269	10,259	90,742	51,163	429,788	1,653	23,564	370,379	3,506,363
1929	279,981	2,700,296	28,008	268,011	49,324	420,689	12,283	154,158	369,596	3,543,154
1930	236,251	2,197,540	18,900	154,428	24,883	209,175	[1] 4,984	[1] 143,817	[1] 285,018	[1] 2,704,960

[1] Includes 2,663 short tons of "clays or earths, artificially activated with acid or other material," valued at $100,779, imported from June 18 to December 31; not separately classified prior to change in tariff.

Total imports of clay in 1930 decreased 84,578 short tons, or 23 per cent, in quantity, and $838,194, or 24 per cent, in value, as compared with 1929. Imports of kaolin, or china clay, which constituted 83 per cent of the total quantity of clay imported in 1930, decreased 16 per cent in quantity and 19 per cent in value as compared with 1929.

Domestic clay exported from the United States, 1921–1930

Year	Fire clay		All other		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1921	23,666	$177,979	23,779	$183,449	47,445	$361,428
1922	24,391	169,664	[1] 23,285	[1] 267,908	47,676	437,572
1923	50,055	303,675	34,840	329,192	84,895	632,867
1924	41,704	312,676	31,051	420,040	72,755	732,716
1925	44,037	350,571	39,006	530,995	83,043	881,566
1926	47,737	348,302	42,157	644,413	89,894	992,718
1927	48,106	392,327	51,278	725,562	99,384	1,117,889
1928	60,138	494,241	60,911	896,350	121,049	1,390,591
1929	76,561	588,770	76,789	1,117,312	153,350	1,706,082
1930	62,660	519,788	73,870	1,108,586	136,530	1,628,374

[1] Includes 2,091 short tons of "kaolin, china, and paper clay," valued at $27,840. Similar exports are not separately classified for other years.

Exports of domestic clays in 1930 were larger than those in any year except 1929; the quantity exported decreased 11 per cent as compared with 1929. Exports of fire clay, which constituted 46 per cent of the total quantity and 32 per cent of the total value of clay exported in 1930, decreased 18 per cent in quantity and 12 per cent in value as compared with 1929.

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[3] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

MAGNESIUM AND ITS COMPOUNDS[1]

By Paul M. Tyler[2]

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INTRODUCTION

Magnesium has rapidly come to the front as a commercial metal of considerable importance, but in accordance with long-established precedent magnesium minerals are still classed as essentially nonmetallic in character and not as ores. Moreover, magnesite, the normal carbonate of magnesium, and dolomite, or high-magnesium limestone, are no longer the sources of the metal. It is now made exclusively from by-product magnesium chloride, which in the United States is obtained from the treatment of salt-well brines. As in former chapters of this series the manufactured compounds considered in this report include the basic or technical carbonates, caustic calcined and dead-burned magnesite, dead-burned dolomite, and precipitated carbonate and salts derived from magnesite or dolomite or crude salts. The dolomite considered in this report is that used because of its magnesium content.

For general information on certain of these commodities reference may be made to the following information circulars published recently by the Bureau of Mines: Information Circular 6437, Magnesite; Information Circular 6406, Magnesium Compounds (Other than Magnesite); and Information Circular 6524, Utilization of Dolomite.

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[1] Work on manuscript completed May, 1931.

[2] Unless otherwise stated, the statistics in this report were prepared by A. E. Davis and the data on imports were compiled from records of the Bureau of Foreign and Domestic Commerce by J. A. Dorsey, both of the Bureau of Mines.

MAGNESITE

The curtailment in steel operations in 1930 was reflected in the sales of domestic dead-burned magnesite. It may be significant that, although there was a substantial reduction in the sales of sintered dolomite, the falling off in the marketed production of the latter competing product was somewhat less serious than that of domestic magnesite, which evidently bore the brunt of the depression. Despite this competition, however, the domestic miners sold more dead-burned magnesite than in 1928 or in any other year since the war, with the single exception of 1929. No new developments in the substitution of chromite for magnesite were noted during the year, and the production of refractory materials from kyanite and similar minerals remained more or less in the experimental stage.

The sales of caustic calcined magnesite, which have been falling off steadily during the last five or six years, received a further setback in 1930. The magnitude of the decline in the use of magnesite flooring is indicated by the reduction in the value of the output of magnesite floor composition, as reported by the Federal Census, from $2,165,182 in 1927 to $1,193,388 in 1929. The production of magnesite stucco, also as reported by the Federal Census, dropped from 29,591 short tons, valued at $1,014,413, in 1927 to 10,163 tons, valued at $448,622, in 1929, a decrease of almost two-thirds in size of output. Although the actual figures are not available, the use of magnesite cement building materials even in 1927 had suffered an enormous reduction, perhaps as much as 50 per cent, since 1923, when they reached the height of their popularity. The new plant of the Northwest Magnesite Co. in Washington began to produce "Thermax," a special mixture of shredded wood and magnesite, similar to the European product "Heraklith." Magnesite lath and tacking strips and other forms of magnesite "lumber" are employed; however, growth in this field is retarded by the keen rivalry of gypsum and other competing products, including mixtures of asbestos fiber and cement made on the job. The mainstay of the caustic calcined business is the flooring trade. Magnesite floors have important advantages, as they withstand bending and are not slippery; however, their installation calls for expensive equipment as well as considerable experience, and the business is becoming concentrated among a relatively small number of larger contractors that specialize more or less in this type of construction.

The Compagnie des Produits Chimiques et Charbons Actifs Ed. Urbain recently completed experiments with a phosphate-ammonia-magnesia fertilizer and later with a phosphate-potash-magnesia product. The company is reported to have in mind undertaking experimental campaigns in various foreign countries where fertilizers containing magnesium might find a market.[3]

In metallurgical research the need for a chemically inert, highly refractory crucible is well recognized. Until recently, however, the art of firing highly refractory crucibles was limited to the production of porous crucibles through which slags would penetrate fairly rapidly, thus making it impossible to utilize such crucibles for more than a few minutes. In 1930 the Nonmetallic Minerals Experiment Station of the Bureau of Mines at Rutgers University, New Brunswick, N. J., studied the forming and firing of crucibles made of finely ground periclase (crystalline magnesium oxide). A method of forming these crucibles has been developed which consists of the use of hydraulic pressure on the material contained in a casehardened steel mold in such a way as to provide uniform compression on the bottom and sides of the crucible. After removal from the mold the crucible is dried at a low temperature and subsequently fired in two stages—first, in an electric muffle furnace up to a bright red heat, and, second, in a vacuum induction furnace up to 2,600° C. The crucibles thus obtained are translucent and impervious to water or alcohol. They are very much more resistant to the action of ferrous silicate slags than the nonvitrified type of crucible heretofore employed in metallurgical research.

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[3] World Trade Notes on Chemicals and Allied Products, vol. 5, No. 11, Mar. 16, 1931, p. 2.

The production of carbon dioxide was one of the earliest uses of magnesite in the United States. The following discussion is abstracted from an article by Reich:[4]

> Magnesite yields CO_2 by three methods. When burned with coke, the absorption system is used. When heated in a closed retort to a temperature of 1,300-1,500° F., its recovery and destruction of the equipment is much greater than in the other two methods. The third method is the treatment of finely ground magnesite in lead-lined containers with sulphuric acid. The liberated gas is freed of its entrained acid and other impurities, collected in the gasometer, and compressed. The magnesium sulphate in solution formed by the action of the acid upon the magnesite is concentrated, crystallized, dried, and brought upon the market as Epsom salt. So far as I am aware, two plants are recovering carbon dioxide according to the last method.

DOMESTIC PRODUCTION

In 1930 mines in the United States produced 129,320 short tons of crude magnesite, with an approximate value of $1,033,130. The value is based on the value of mined material as reported by the majority of the producers plus an estimate for those who reported no value for the mined crude magnesite. The 1930 tonnage is a decrease of 31 per cent as compared with 1929 but slightly exceeds the 127,200 tons reported for 1928. Shipments consisted chiefly of caustic or dead-burned material. As in previous years, the production was wholly from California and Washington.

Crude magnesite mined in the United States, 1921–1930 [a]

Year	California		Washington		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1921 [a]	47,904	$510,177			47,904	$510,177
1922 [a]	[b] 55,790	[b] 571,745	([b])	([b])	55,790	571,745
1923	73,350	938,600	73,900	$165,100	147,250	1,103,700
1924	67,240	901,700	52,860	139,600	120,100	1,041,300
1925	64,600	872,100	56,060	560,600	120,660	1,432,700
1926	53,940	604,130	79,560	596,700	133,500	1,200,830
1927	43,750	507,500	77,740	583,050	121,490	1,090,550
1928	41,300	454,300	85,900	644,250	127,200	1,098,550
1929	[b] 187,660	[b] 1,500,000	([b])	([b])	187,660	1,500,000
1930	[b] 129,320	[b] 1,033,130	([b])	([b])	129,320	1,033,130

[a] Figures for 1921 and 1922 recorded as "Domestic magnesite (expressed as equivalent crude) sold or treated in the United States."

[b] Washington included with California. Bureau of Mines not at liberty to publish figures.

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[4] Reich, G. T., Liquid CO_2—How Technology Has Harnessed the Available Sources: Chem. and Met. Eng., vol. 38, No. 3, March, 1931, p. 141.

Magnesite of domestic origin sold by producers in the United States, 1922–1930

Year	Crude			Caustic calcined			Dead-burned		
	Short tons	Value		Short tons	Value		Short tons	Value	
		Total	Average		Total	Average		Total	Average
1922	1,300	$13,330	$10.25	21,990	$813,630	$37.00	2,200	$51,260	$23.30
1923	6,020	78,260	13.00	28,470	1,035,740	36.38	34,410	671,000	19.50
1924	1,570	20,410	13.00	26,520	883,120	33.30	29,830	787,500	26.40
1925	2,090	26,290	12.58	23,900	782,700	32.75	29,110	923,960	31.74
1926	1,540	17,440	11.32	18,580	596,370	32.10	42,540	1,089,680	25.62
1927	1,800	17,130	9.52	13,890	452,810	32.60	40,210	990,300	24.63
1928	620	5,690	9.18	13,310	454,820	34.17	45,230	1,076,310	23.80
1929	--------	--------	--------	11,390	405,020	35.56	78,700	1,542,840	19.60
1930	1,120	14,410	12.87	8,580	260,010	30.30	49,460	903,450	18.27

The companies in California and Washington producing magnesite in 1930 were as follows:

California:
  Sampson Magnesite Co., 803 Balfour Building, San Francisco.
  C. S. Maltby Magnesite Co. (Ltd.), 1308 Humboldt Bank Building, San Francisco.
  California Magnesite Co., 1 Montgomery Street, San Francisco.
  Sierra Magnesite Co. (Ltd.), 111 Sutter Street, San Francisco.
Washington: Northwest Magnesite Co., Farmers Bank Building, Pittsburgh, Pa.

MARKETS AND PRICES

The Engineering and Mining Journal quotations in 1930 were essentially the same as in 1929. Throughout the year grade A caustic calcined magnesite (80 per cent through 200-mesh) was quoted at $43 and grade B at $40 per short ton, f. o. b. California mines. Dead-burned grain magnesite was quoted at $29 f. o. b. California steel plants; $22 f. o. b. Chewelah, Wash.; and $40 per short ton f. o. b. Chester, Pa., or Baltimore, Md. Magnesite brick remained stationary at $65 per short ton for 9-inch straights f. o. b. eastern works. The price of crude was nominal.

CRUDE MAGNESITE

Sales of crude have shown a downward tendency since 1923, and in 1929 no crude magnesite was reported as sold by producers. In 1930, however, there was a resumption of such sales, and the prices realized were better than in former years; the sales were 1,120 short tons, valued at $14,410 or $12.87 a ton. Imports of crude magnesite likewise increased in 1930.

CAUSTIC CALCINED MAGNESITE

The sales of domestic caustic calcined magnesite reported in 1930 were the smallest since before the World War, amounting to only 8,580 short tons, valued at $260,010 or $30.30 a ton. As compared with 1929 the quantity decreased 24.7 per cent and the value 35.8 per cent. Prices reported by producers were as high as $40 a ton, but much of the material was sold for $28 a ton f. o. b. California mines.

DEAD-BURNED MAGNESITE

The domestic dead-burned magnesite sold in the United States in 1930 amounted to 49,460 short tons, valued at $903,450, a decrease of 37.2 per cent in quantity and 41.4 per cent in value as compared with 1929. The price of the ordinary dead-burned or grain magnesite, as reported by California producers, ranged from $24 to $33 a ton f. o. b. mine, but $60 a ton was obtained for special high-grade material. As in former years the bulk of the production came from Washington, but the California output has reached substantial proportions.

IMPORTS

Imports of magnesite for consumption in 1930 were 842 short tons of crude magnesite, valued at $8,687; 3,911 tons of caustic calcined, valued at $66,523; and 41,417 tons of dead-burned, valued at $624,713. As compared with 1929 these figures represent an increase of 542 tons (181 per cent) in the imports of crude, a decrease of 2,589 tons (40 per cent) in the imports of caustic calcined, and a decrease of 8,962 tons (18 per cent) in the imports of dead-burned.

Magnesite imported into the United States, 1926–1930, by countries, in short tons

[General imports]

Country	1926	1927	1928	1929	1930
Austria	7,028	39,752	34,997	31,908	26,304
Belgium	303	187	25	22	32
Canada	41	213	45		83
Czechoslovakia	1,688	9,666	21,876	12,520	19,080
Denmark	360				
Germany	169	74	358	59	264
Greece	594	840	760	310	976
India, British	9,223	5,795	3,426	4,259	2,563
Italy	68,269	317		1,634	5
Kwantung	25				
Netherlands	3,944	3,167	1,959	2,055	1,102
Poland and Danzig		(1)			
Soviet Russia in Europe				276	714
United Kingdom	902	213	56	139	72
	92,546	60,224	63,502	53,182	51,195

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[1] 1,100 pounds.

Magnesite imported into the United States, 1929 and 1930

[General imports]

Country	Crude		Caustic calcined		Dead-burned and grain (not suitable for manufacture into oxychloride cements)	
	Pounds	Value	Pounds	Value	Pounds	Value
1929						
Austria					63,815,456	$452,489
Belgium			43,210	$850		
Czechoslovakia					25,039,129	194,814
Germany			29,994	1,234	88,925	896
Greece	564,443	$2,898	55,385	622		
India, British			8,519,420	76,002		
Italy					3,268,624	16,051
Netherlands			4,110,189	59,668		
Soviet Russia in Europe					552,252	5,916
United Kingdom	35,000	281	242,542	7,498		
	599,443	3,179	13,000,740	145,874	92,764,386	670,166
1930						
Austria					52,607,745	384,045
Belgium			64,981	1,176		
Canada	4,960	124			161,380	6,052
Czechoslovakia					38,159,797	285,972
Germany			18,526	592	508,578	4,643
Greece	1,680,000	8,563	272,702	2,996		
India, British			4,004,000	36,612	1,122,263	11,523
Italy			9,888	147		
Netherlands			2,204,351	31,731		
Soviet Russia in Europe			114,492	2,421	1,312,803	10,221
United Kingdom			143,286	2,806		
	1,684,960	8,687	6,832,226	78,481	93,872,566	702,456

Caustic calcined magnesite imported into the United States in 1930, by countries

[General imports]

Country	Jan. 1 to June 17[1]		June 18 to Dec. 31				Total	
			Lump		Ground			
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
Belgium	21, 660	$422	----------	--------	43, 321	$754	64, 981	$1, 176
Germany	14, 365	492	3, 472	$87	689	13	18, 526	592
Greece	87, 198	958	----------	--------	185, 504	2, 038	272, 702	2, 996
India, British	2, 680, 000	23, 691	1, 324, 000	12, 921	----------	--------	4, 004, 000	36, 612
Italy	----------	--------	----------	--------	9, 888	147	9, 888	147
Netherlands	870, 164	12, 861	65, 506	977	1, 268, 681	17, 893	2, 204, 351	31, 731
Soviet Russia in Europe	----------	--------	114, 492	2, 421	----------	--------	114, 492	2, 421
United Kingdom	24, 640	675	1, 120	74	117, 526	2, 057	143, 286	2, 806
	3, 698, 027	39, 099	1, 508, 590	16, 480	1, 625, 609	22, 902	6, 832, 226	78, 481

[1] Not separately classified as "Lump" and "Ground" prior to change in tariff, June 18.

Magnesite imported for consumption in the United States, 1921–1930

Year	Crude		Calcined		Year	Crude		Calcined	
	Short tons	Value	Short tons	Value		Short tons	Value	Short tons	Value
1921	51, 993	$525, 452	6, 788	$250, 932	1926	608	$6, 555	90, 293	$1, 438, 765
1922	73, 331	976, 283	72, 265	1, 267, 622	1927	856	8, 574	59, 261	946, 361
1923	5, 182	44, 081	72, 955	1, 022, 968	1928	762	6, 264	62, 481	966, 183
1924	6	85	64, 785	1, 172, 403	1929	300	3, 179	56, 879	877, 090
1925	487	6, 382	68, 395	1, 160, 830	1930	842	8, 687	45, 328	691, 236

ANNUAL SUPPLY

The annual additions to supply of magnesite may be considered as domestic sales plus imports, as exports are negligible. Although such figures take no account of stocks at grinding mills and in consumers' hands, they do furnish a fairly accurate index of consumption.

Magnesite supply in the United States, 1923–1930, in short tons

Year	Crude			Caustic calcined			Dead-burned		
	Domestic (sales)	Imports for consumption	Total new supply	Domestic (sales)	Imports for consumption	Total new supply	Domestic (sales)	Imports for consumption	Total new supply
1923	6, 020	5, 182	11, 202	28, 470	11, 229	39, 699	34, 410	61, 726	96, 136
1924	1, 570	6	1, 576	26, 520	16, 134	42, 654	29, 830	48, 651	78, 481
1925	2, 090	487	2, 577	23, 900	17, 075	40, 975	29, 110	51, 320	80, 430
1926	1, 540	608	2, 148	18, 580	14, 758	33, 338	42, 540	75, 535	118, 075
1927	1, 800	856	2, 656	13, 890	9, 568	23, 458	40, 210	49, 693	89, 903
1928	620	762	1, 382	13, 310	5, 474	18, 784	45, 230	57, 007	102, 237
1929	----------	300	300	11, 390	6, 500	17, 890	78, 700	50, 379	129, 079
1930	1, 120	842	1, 962	8, 580	3, 911	12, 491	49, 460	41, 417	90, 877

DOMESTIC INDUSTRY

California.—Four companies operating five mines contributed to the production of California magnesite in 1930. As in former years, the mines of the C. S. Maltby Magnesite Co. (Ltd.) in Santa Clara County were the largest source of supply in the State. This company operated four stack kilns and one rotary furnace, producing both caustic calcined and dead-burned magnesite. The Sierra Magnesite Co. (Ltd.), the second largest operator in the State, came into production at its Bald Eagle mine in Stanislaus County near Gustine. Properties in the same vicinity previously owned or operated by A. D. Davenport, E. S. Kingsley (deceased), and H. Knight were amalgamated with the Sierra Magnesite Co. and will henceforth be operated as the Bald Eagle mine. This company's mine in Tulare County at Magnesite, 12 miles east of Porterville, was also operated. The company's calcining plant is at Porterville, where both caustic calcined magnesite and "periclase," a special grade of dead-burned magnesite, are produced in two rotary kilns. The California Magnesite Co. continued to operate the Red Mountain mine in Stanislaus County (formerly leased to the Red Mountain Magnesite Co.) and in addition to crude and calcined magnesite for magnesia heat-insulating purposes made and sold a small quantity of dead-burned material for refractory uses. The Sampson Magnesite Co., San Benito County, produced dead-burned magnesite in its 20-ton rotary furnace. F. M. Nevins, who did considerable development work at Parkfield, Monterey County, in 1929 and expected to make shipments in 1930, was reported deceased; no further progress toward commercial production has been made in that area. Other mines and prospects in these counties and in Alameda, Fresno, Placer, San Bernardino, Sonoma, and Tuolumne Counties have reported no production during the past two or three years.

Nevada.—The United States Brucite Corporation (H. A. Severinghaus, vice president and manager), affiliated with the Standard Slag Co., Youngstown, Ohio, was engaged actively in diamond drilling. According to a communication from Prof. Jay A. Carpenter, of the Mackay School of Mines, a very large tonnage of practically pure brucite (natural magnesium hydrate) has been indicated. Drill cores are in brucite down to 400 to 500 feet. This deposit, formerly opened by H. E. Springer, is about 40 miles due east of Schurz, a fair-size settlement at the north end of Walker Lake. It is a little over 35 miles from the railroad, but the construction of a branch line is facilitated because the railroad grade put into Rawhide during the boom days can be utilized for about half the distance.

According to a communication from M. W. Young, a new deposit of brucite has been reported near Lodi Tanks, Nev. Bowlders of pure brucite, probably weathered material, occur in a deposit 2 to 3 feet thick overlying limestone.

No production was reported from magnesite deposits at St. Thomas, Clark County.

Washington.—The Northwest Magnesite Co. operating the Finch mine near Chewelah, Stevens County, was again the only producer in the State of Washington. Two of its six kilns were operated more or less continuously during the year. In addition to its regular production of dead-burned magnesite the company engaged in the production of "Thermax," a magnesite wood product used in sound-proofing and thermoinsulation. The history of the Northwest Magnesite Co., with a description of its operations (particularly a 5-mile aerial tramway capable of delivering 200 tons in eight hours), was published during 1930.[5]

The Crosby Magnesite Co. and the Double Eagle Mining Co. produced no magnesite from their properties in 1930.

WORLD PRODUCTION

World production of magnesite, 1925–1929, by countries, in metric tons [1]

[Compiled by M. T. Latus, of the Bureau of Mines]

Country	1925	1926	1927	1928	1929
Australia:					
New South Wales	14,237	10,428	10,178	10,840	9,097
Queensland	271	----------	----------	----------	----------
South Australia	357	230	335	46	137
Victoria	92	96	73	73	27
Austria	290,000	237,000	356,000	310,000	438,000
Canada	3,827	11,429	18,523	33,311	39,216
China	[2] 13,773	(3)	[2] 21,400	(3)	(3)
Cyprus [4]	----------	83	16	----------	----------
Czechoslovakia [5]	69,532	83,135	84,563	87,396	101,118
Greece	90,828	95,638	84,484	104,421	84,023
India, British	30,095	30,950	19,953	24,798	23,874
Italy	14,146	19,842	16,304	11,690	17,172
Norway	1,699	715	1,090	932	1,028
Russia [6]	75,840	103,017	[7] 106,583	[7] 119,985	132,710
Turkey	----------	----------	----------	----------	196
Union of South Africa	1,823	1,884	1,839	1,481	1,709
United States	109,460	121,109	110,213	115,393	170,241
Yugoslavia [8]	----------	----------	1,680	6,267	6,615

[1] Unless otherwise stated, the quantities in this table represent crude magnesite mined.
[2] As estimated by the Geological Survey of China. (General Statement of the Mining Industry, Peiping.)
[3] Data not available.
[4] Exports.
[5] Exports, less imports, of crude and sintered magnesite, the sintered being reduced to crude on the basis of 2.1 tons crude to 1 ton sintered.
[6] Year ended Sept. 30.
[7] Exclusive of magnesite sand, as follows: 1927, 77,211 tons; 1928, 8,799 tons.
[8] Serbia only.

FOREIGN INDUSTRY

Austria, Czechoslovakia, Greece, British India, Southern Manchuria, Canada, Russia, and Venezuela contain extensive deposits of magnesite; Germany, Norway, Italy, Yugoslavia, Spain, Cyprus, Australia, South Africa, and numerous other countries also contribute more or less regularly to world requirements. Until 1914, Austria-Hungary and Greece supplied the bulk of the world's magnesite, but the list of producing countries has been greatly enlarged since that time. Of the pre-war output of Austria-Hungary about 75 per cent was produced in Austria and 25 per cent in what is now Czechoslovakia, and these States are still important factors in world supply although relatively less so than in 1913.

Austria.[6]—The total Austrian output of crude magnesite, including both crystalline and amorphous, during 1930 is estimated at 304,000 metric tons, a decrease of 134,000 tons or about 30 per cent in comparison with 1929. As in former years, four companies contributed to the output, but two of them—Veitscher Magnesitwerke A. G. and the Oesterreichisch-Amerikanische Magnesit A. G., the latter an American-owned concern—accounted for fully 90 per cent of the total, including all of that which was dead-burned. The production of dead-burned magnesite was 124,226 metric tons, only 9 per cent less than in 1929 and substantially more than in 1928. At the end of 1930 1,600 employees were engaged in the production of dead-burned magnesite, of whom 1,033 were employed by the Veitsch company. The production of magnesite bricks (included in the tonnage of dead-burned magnesite) during 1930 amounted to 41,083 metric tons, as compared with 46,600 tons in the previous year. The output of caustic calcined magnesite dropped 16 per cent, being estimated at 29,500 metric tons in 1930, as compared with 35,000 tons in 1929. Roughly, one-half of the production of this material is furnished by the Austrian-American Co. and the remainder by the two smaller concerns, the Steirische Magnesitindustrie A. G. and the Alpenländische Bergbaugesellschaft, m. b. H.

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[5] Pit and Quarry, vol. 19, No. 12, 1930.
[6] Harris, E. H., consul general, Vienna, Mar. 25, 1931.

In 1930 Austria exported 926 metric tons of crude magnesite, 58,039 tons of dead-burned, and 26,882 tons of caustic calcined; the corresponding figures for 1929 were 1,422, 90,245, and 27,465 tons, respectively. No material changes in the direction of this trade were noted. The small exports of crude magnesite were directed chiefly to German border districts. Shipments to the United States accounted for nearly 50 per cent of the exports of dead-burned, the remainder being shipped chiefly to Great Britain and Germany and smaller amounts to France and Italy. Germany is the principal purchaser of Austrian caustic calcined, which is also shipped, however, to France and Czechoslovakia and to other countries, including Hungary, Switzerland, and Poland.

Prices, on the whole, were stable throughout the year, remaining at \$19.40 and \$43.50 per metric ton for dead-burned grain magnesite and brick, respectively, at the Styrian factory for domestic retail business.

The world-wide depression in iron and steel, as reflected in the sharp decline in the exports of dead-burned magnesite, combined with a relatively small curtailment in production, resulted in a further increase in stocks of dead-burned material that were beginning to accumulate even toward the end of 1929. Due to the reduced volume of sales, dividend reductions were announced by the Veitsch company and by the Styrian company, and the market value of the stock of the latter company declined from \$12.20 on December 31, 1929, to \$6.63 on December 31, 1930, or a decline of about 45 per cent. Only a nominal drop was noted in the Veitsch stock—from \$246 to \$237—but this is explained by the fact that the shares are closely held by foreign and domestic syndicates which did not have to liquidate their holdings.

Canada.—The production of "calcined or clinkered" magnesite in Canada, according to the Dominion Bureau of Statistics, was 13,336 short tons, valued at \$336,162, in 1930, as compared with 18,809 tons, valued at \$491,170, in 1929. Exports dropped from 5,279 short tons in 1929 to 1,851 tons in 1930. The Government has rendered technical aid in research directed toward improving the quality of magnesite from Quebec deposits. Late in 1930, as a further means of stimulating the home industry, the duties on both caustic calcined and dead-burned magnesite were increased. Dead-burned or sintered magnesite—hitherto free under the British preferential tariff and dutiable at 10 per cent under the intermediate and at 17½ per cent under the general tariff—has been made dutiable at 20, 25, and 25 per cent under the respective classifications. The former rates upon caustic calcined magnesite, or plastic magnesia, were free, 20 per cent, and 25 per cent under the British preferential, intermediate, and general tariffs, respectively; they are now increased to 20, 25, and 25 per cent.

The following notes on the Canadian magnesite situation are abstracted from a synopsis issued by the Canadian Pacific Railway Co.:

In Canada the principal deposits yet worked are in the county of Argenteuil, Quebec, some 60 miles west of Montreal near the Canadian Pacific Railway "North Shore" line between Montreal and Ottawa. These deposits are of the crystalline type. As yet they have been only partially worked. About 250,000 tons have been mined and a portion of this calcined. The aggregate value obtained to the end of 1929 was nearly $5,000,000.

The deposits occur as replacements in ancient crystalline limestones of the Grenville series, near intrusions of igneous rocks, generally of basic composition. The deposits are large but contain portions of dolomite, serpentine, and other minerals that require separation in mining. Quarries have been opened in 9 or 10 deposits. The deposits range in surface area from 5,000 to 75,000 square feet. The proportion of magnesite in the deposit in some cases is as high as 70 per cent and in most places above 50 per cent.

Depths of 100 to 200 feet have been proved by drilling, but the total depth has not yet been reached by the quarries.

Reserves in developed localities have been estimated by the Geological Survey of Canada to be in excess of 600,000 tons of magnesite and nearly 500,000 of magnesite-dolomite. In addition there are occurrences whose contents are not yet estimated.

Other deposits are known in Canada. At Orangedale, Cape Breton Island, Nova Scotia, a deposit of the brown, crystalline variety has been operated locally. Unworked deposits of possible use are reported at West Beach, New Brunswick; at Thetford Mines; in the County of Brome, Quebec; near the main line of the Canadian Pacific Railway, about 71 miles west of Fort William; and at Illecillewaet, on the main line of the Canadian Pacific Railway about 40 miles east of Revelstoke, and in the Bridge River District, British Columbia. Deposits of hydromagnesite, estimated to contain more than 180,000 tons, occur near the town of Atlin, British Columbia. Somewhat similar types of deposits are known in the Quesnel district, 90 miles north of Ashcroft.

Open cut, or quarrying, is the only method yet employed in Canada. Hand cobbing is necessary to secure uniform grades. The content of magnesium carbonate attained is commonly between 85 per cent and 95 per cent. Much of the magnesite is roasted near the quarries in order to reduce carriage costs to the point of use. It is either calcined at 800° to 1,000° C., to reduce the carbon dioxide content to 3 per cent or 4 per cent, or is double or "dead-burned," with addition of iron, at 1,200° to 1,500° C., reducing the carbon dioxide to less than 1 per cent.

The quality of the output is now thoroughly established, and Quebec dead-burned magnesite has carried the approval of steel manufacturers under rigid investigation and practical experiment (see Quebec Bureau of Mines' Report, 1924, p. 90). * * *

The production for 1928 was made entirely by the North American Magnesite Producers (Ltd.) and the Scottish Canadian Magnesite Co., which operate jointly at Magnesite, Quebec, and the International Magnesite Co. of Calumet (Kilmar), Quebec.

The provinces of Nova Scotia, Quebec, and Ontario do not demand royalties but tax profits on mines in excess of $10,000 as does the Dominion Government in Saskatchewan, Alberta, and the Yukon. The province of British Columbia imposes a tax of 2 per cent on any production of $5,000 or more. At the discretion of the Provincial Governments royalties may be imposed in New Brunswick and Manitoba. No bounties are granted. * * *

Germany.—The large deposits of magnesite in Silesia, Germany, have been described in a recent article.[7] The magnesite is white and practically free from iron and lime. It is used principally in the manufacture of xylolite, a heat and sound insulating material made from caustic calcined magnesite, magnesium chloride, and filling material (ground wood or asbestos), colored and pressed into plates.

Russia.—Magnesite occurs in the Urals, Caucasus, the Middle Volga, and other regions in the Soviet Union. The Ural deposits alone are estimated to contain 30,000,000 tons. In 1913 Russia had to import considerable quantities of magnesite, as the domestic production was insufficient to supply the requirements of the country. In recent years, however, imports have virtually ceased and an increasingly large exportable surplus has been developed. Even in the fiscal year ended September 30, 1930, the foreign sales exceeded those in the preceding year and during the first 10 months amounted to more than 20,000 tons, as compared with 16,448 metric tons during the 12 months of the preceding fiscal year. The latter in turn were double those during the 1927–28 period. Magnesite bricks, as well as grained magnesite, are sold in the world markets. Russian bricks are said to be lower in specific gravity than those made, for example, in Czechoslovakia.

South Africa.—In the Union of South Africa amorphous magnesite is found in deposits of considerable size in the Barberton district, Eastern Transvaal, at various localities near the railway line between the stations of Kaapmuiden and Malelane. Kaapmuiden is about 87 miles from Delagoa Bay and 300 miles from Johannesburg. In 1913 the Transvaal produced 661 short tons of magnesite; in recent years the output has averaged a little under 2,000 tons. It is used locally for refractory purposes and for the manufacture of carbon dioxide.

Yugoslavia.—In Serbia, magnesite deposits have been reported at Milicevats, Valjevo, Kozomor, Avala, Slivovitsa, Stragari, Drenova, Kostanitsi, and Kraljevo; in the Province of Bosnia, at Dubositsa, Bijeli Klanci, and Blatnitsa; and in Slovenia, at Reichenau. Many of these deposits are small and probably have no commercial importance. In central Serbia, however, there is a belt about 1½ kilometers wide and 10 kilometers long, following the Vardar River and about 25 kilometers south of Skoplje, which contains deposits of considerable apparent value. The Ivan mines at Milicevats in the department of Roudnik have been worked and are credited with reserves amounting to 6,645,000 metric tons within a mineralized area of approximately 800 hectares. Brown coal is found near by. The nearest railroad station, Premina, 7 kilometers away, is 489 kilometers from the Adriatic port of Metkovich and 123 kilometers from Zabrez on the Save River. The freight to Metkovich is said to be 50 dinars (about 90 cents) a metric ton.

Serbian magnesite is of the compact or cryptocrystalline type similar to that mined in Euboea (Greece). As it is low in both iron and lime it is suitable for the production of caustic calcined magnesite. According to Ignatieff,[8] who recently described the deposits and discussed their genesis, a picked sample gave the following analysis: $MgCO_3$, 98.25 per cent; $CaCO_3$, 1.16 per cent; Fe_2O_3, 0.28 per cent; and SiO_2, 0.12 per cent.

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[7] Reimers, A., Silesian Magnesite: Keramos, vol. 9, No. 23, 1930, pp. 875–877; Ceram. Abs., vol. 10, No. 3, March, 1931, p. 195.

[8] Ignatieff, A., Magnesite Deposits of Serbia: Min. Mag. (London), vol. 42, No. 4, April, 1930, p. 217–221.

The production of magnesite from Yugoslavia was first reported in 1927. After producing at the rate of a little more than 6,000 tons a year in 1928 and 1929, the industry expanded substantially early in 1930, providing employment for nearly 300 persons, more than double the number so employed in 1929. Most of the output is exported.

NEW PROCESSES AND PATENTS

An unusual number of new developments was announced in 1930. The following patent and other references have been selected as being potentially of special importance:

BENABENQ, —. Magnesite brick. French Patent 620203. Refrac. Jour., vol. 5 (53), 1930, p. 196. Jour. Am. Ceram. Soc. (Ceram. Abs.), vol. 9, No. 5, May, 1930, p. 361.

It is proposed to produce a magnesite, dolomite, or lime brick by sintering the raw materials, pulverizing, and mixing with 30 per cent of powdered alkali chloride. After molding at high pressure the firing is carried out at 1700° C. over a period of 30 to 40 hours.

BIRNKOW, B. Refractories. Russian magnesite on international market. Tonind.-Ztg., vol. 53 (52), 1929, pp. 928–930. Jour. Am. Ceram. Soc., Abs. Bull., vol. 9, No. 1, January, 1930, p. 41.

Chemical composition and physical properties of various brands of magnesite exported from Russia are discussed.

CORDES, F. Specifications for magnesite. Baumarkt, vol. 29, 1930, p. 3. Rock Products, vol. 33 (5), 1930, p. 88. Jour. Am. Ceram. Soc., Abs. Bull., vol. 9, No. 6, June, 1930, p. 437.

Cordes adds to a previous report concerning proposed specifications for magnesite, giving a table of chemical analysis of 20 magnesites found on the German market.

DWORZAK, E. Russian and Slovakian magnesite. Feuerfest, vol. 6, 1930, pp. 145–150. Chem. and Ind. (London), vol. 50, No. 1, Jan. 2, 1931, p. 21. Brit. Chem. Abs.

Chemical analyses of a number of magnesite bricks of Austrian, Slovak, and Russian origin are given, and a comparison is made of the color, composition, and physical properties both of the bricks and of the granular, calcined material. Russian magnesite bricks have a higher magnesia content ($<$ 92 per cent MgO) than the Slovak, with consequent greater refractoriness and refractoriness under load. A lower flux content makes them less vitreous and more porous, and owing to the lower firing temperature the specific gravity is somewhat lower than that of the Slovak bricks. In spite of the higher porosity, the Russian bricks are equally resistant to slag attack. The chemical composition of the Russian calcined magnesite is the same for all granulations, that is, about 91 per cent MgO and 3 per cent Fe_2O_3. A grain size of 0–5 mm. gives the most satisfactory degree of vitrification both with the Russian and Slovak material, and if larger grades are used a certain proportion of fines must be added to act as a bond. In steel works, up to 15 per cent of open-hearth furnace slag, with a grain size of about 5 mm., may be added to the Russian magnesite to assist vitrification.

HARBISON-WALKER REFRACTORIES Co. Refractories. Refractory substances. British Patent 317449, Oct. 9, 1929. Jour. Am. Ceram. Soc., Abs. Bull., vol. 9, No. 1, January, 1930, p. 47.

Serpentine is made suitable for use as a refractory material by being calcined at a temperature high enough, about 2900° F., to drive off its volatile constituents and reduce its porosity below 20 per cent. The calcined clinker is ground and may then be made into brick by being mixed with lingum liquor and molded, or by being mixed with water, molded, and fired at a temperature about 100° F. lower than the calcining temperature. The serpentine may be blended with magnesite to modify the refractory qualities of the product.

Kethel, R. J. B. Magnesite: Its application in assaying. Jour. Chem. Met. Min. Soc. South Africa, vol. 30, 1930, pp. 323–328. Chem. and Ind. (London), vol. 49, No. 40, Oct. 3, 1930, p. 912. (Chem. Abs.)

South African magnesite deposits contain an average of 90 per cent $MgCO_3$ and 5 per cent SiO_2. For making cupels for gold assaying the material is calcined at 600°, ground to a fine powder, mixed with water, and molded into bricks which are heated to 1250° in 3 to 7 days in reverberatory or muffle furnaces. The calcined magnesia thus obtained is crushed so that 70 to 75 per cent passes 200-mesh, mixed to a damp powder with a solution of glue or sugar, and pressed into the desired cupel shape in hand or compressed-air presses. The cupels are dipped into a 1 per cent solution of sodium silicate and dried for 12 hours at 100°, then set aside in a dry warm place to mature. A good cupel should absorb 86 to 90 per cent of its weight in lead.

Krieger, A. Hardening of Sorel cements. Tonind.-Ztg., vol. 54 (34), 1930, pp. 577–578. Jour. Am. Ceram. Soc., Abs. Bull., vol. 9, No. 8, August, 1930, pp. 613–614.

Sorel cement prepared from the magnesite of Greece was investigated. The $MgCl_2$ was determined by alcoholic extraction. It was found that the paste can be heated to boiling without affecting the results, as the oxychloride is not decomposed by boiling alcohol. After filtering, the filtrate was found to contain uncombined $MgCl_2$ and free H_2O. The residue consists of the combined water, $MgCl_2$, $Mg(OH)_2$, MgO, impurities of magnesite, and sand. The $Mg(OH)_2$ content can be calculated from the loss on ignition and is 13.93 per cent. Examples are given that show the exactness of the values. It is not possible to establish a formula for the oxychloride compounds by this method or to fix what quantity of $Mg(OH)_2$ goes in double combination with $MgCl_2$. By specific tests the proportion of $MgCl_2:Mg(OH)_2$ from 1:3 to 1:15 was established. Comparative tables show the changes in content of waters, etc., of a slightly fired magnesia and a Euboea magnesite after 3, 5, 8, and 28 hours hardening. The problem was to determine whether the beginning of hardening depends on the $Mg(OH)_2$ or oxychloride formation. After 5 hours the magnesium mortar has a higher content of combined $MgCl_2$, while the content of $Mg(OH)_2$ is higher in magnesite. As the magnesium mixture is already hard at this stage and the magnesite is still soft, it can be concluded that the beginning of hardening is caused by the formation of oxychloride.

Kurnakov., N. S., Shemtschushni, S. F., and Ageeva, V. A. Magnesium cement. Jour. Applied Chem. (Russia), vol. 2, 1929, pp. 651–661. Chem. and Ind. (London), vol. 49, No. 27, July 4, 1930, p. 614.

Cement containing magnesium chloride has three setting periods; the three breaks in the heating curve are due, respectively, to the boiling of the magnesium chloride solution, the dissociation of magnesium hydroxide, and the formation of a solid (possibly basic magnesium chloride). The region of maximum hardness is within the limits of the third break.

Metallges., A. G. Manufacture of refractory materials from natural magnesium silicates. British Patent 337605, Nov. 9, 1928. Metals and Alloys, vol. 2, No. 1, January, 1931, p. 23.

Nishida, K., and Nakamura, S. Causticizing ammonium chloride with magnesium oxide. Rept. Lab. South Manchuria Railway, 1929, pp. 37–39. Chem. and Ind. (London), vol. 49, Dec. 5, 1930, p. 1108.

An attempt to utilize light-burned magnesite in the place of lime for causticizing ammonium chloride in the Solvay process has shown that the former is weaker than the latter and that for 100 per cent recovery of ammonia the ammonia liquors must be diluted from 3.46N to 2.34N. From the rate of distillation it is calculated that the amount of fuel required in the magnesite method is thrice that for the lime; hence, the former method is not economical unless the value of the recovered magnesium chloride is sufficient to cover the cost of the fuel.

O'Harra, B. M., and Slagle, E. A. Magnesite refractories. U. S. Patent 1747905, 1930, and various foreign patents (assigned to American Smelting & Refining Co.). Refrac. Jour. (England), vol. 5, No. 60, September, 1930, p. 460.

A magnesite brick refractory without iron or other foreign bond is proposed, consisting of 90 per cent calcined magnesite and 10 per cent colloidal magnesium carbonate, molded at high pressure and fired at high temperature to transform the magnesium carbonate completely into periclase.

Rees, W. J., and Chesters, J. H. The magnesia-zircon series. Trans. Ceram. Soc. 1930, pp. 309–316. Refrac. Jour., vol. 6, No. 63, December, 1930, p. 112.

The incorporation of zircon into magnesia products is claimed to reduce shrinkage and subsequent cracking of the fired product. The authors suggest that zircon consists of magnesium zirconium silicate.

Refractories Journal. Magnesite crucibles. Vol. 5 (53), 1930, p. 165. Jour. Am. Ceram. Soc. (Ceram. Abs.), vol. 9, No. 5, May, 1930, p. 358.

Experiments made by Roure, of the high school of foundry, on superheating of cast iron, showed that no refractories had been obtained which could resist up to 1710° C. Portevin said that he had used crucibles of specially prepared magnesite which had resisted up to 2200°, but only small crucibles can be made in such a way.

Sperni, J. C. G. Cement. British Patent 332282, Sept. 10, 1930. Jour. Am. Ceram. Soc., vol. 13, No. 12, December, 1930, p. 1023. Abs. Bull., vol. 9, No. 12.

A magnesian cement is mixed with 5 to 25 per cent by bulk of manganese oxide to prepare a hard-setting cement. A solution of sodium silicate may be added to improve the waterproof properties and small quantities of potassium salts. A suitable magnesian cement is produced by finely powdering together burned magnesite and dry unburned clay, or magnesite and clay may be burned together, the manganese oxide being added before or after. Fillers such as sand, sawdust, fiber, cork, leather waste, or pigments such as 5 per cent ferric oxide may be incorporated. Specification 200311 is referred to.

DOLOMITE[9]

DOLOMITE PRODUCTS

The uses of dolomite as well as limestone for flux in blast furnaces and open-hearth steel furnaces and the use of dead-burned dolomite as a refractory furnace lining have been reviewed by Bowles.[10] Dolomite for open-hearth lining is usually precalcined, but when employed for patching on slag lines it is used raw. Miscellaneous uses for dolomite are discussed in Information Circular 6524, recently issued by the Bureau of Mines.

The sales of dolomite for uses that may be considered competitive with magnesite have been segregated so far as possible by the Bureau of Mines for many years. The approximate quantity of crude dolomite used in the manufacture of such products has been as follows:

Crude dolomite sold by producers in the United States for certain uses, 1921–1930, in short tons

[Includes dead-burned dolomite, basic magnesium carbonate, sulphite process of paper manufacture, and making of carbon dioxide]

1921	499,000	1926	1,480,000
1922	1,074,000	1927	1,355,000
1923	1,226,000	1928	1,605,000
1924	1,239,000	1929	1,654,000
1925	1,425,000	1930	1,360,000

DEAD-BURNED DOLOMITE

Dead-burned dolomite is used principally as refractory material. The quantity so used is many times that of dead-burned magnesite, and a comparison of the figures in the following table with those given on page 186 as representing the total new supply of dead-burned magnesite indicates that the average consumption of dolomite refractories is increasing more rapidly than that of magnesite products Some manufacturers of dead-burned dolomite buy their stone, the sales of which are reported by the quarry companies in terms of crude stone; others quarry their own stone and report only in terms of dead-burned material. The two kinds of material, as well as the estimated total output in terms of dead-burned dolomite, are represented in the following table:

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[9] Figures on dolomite compiled by A. T. Coons, of the Bureau of Mines.

[10] Bowles, Oliver, Utilization Problems of Metallurgical Limestone and Dolomite: Am. Inst. Min. and Met. Eng., Tech. Pub. 62, Class C, Iron and Steel, No. 8; Class H, Nonmetallic Minerals, No. 1.

Dead-burned dolomite sold or used by producers in the United States, 1921–1930

Year	Reported as raw stone		Reported as dead-burned		Total quantity calculated as dead-burned (short tons)
	Short tons	Value	Short tons	Value	
1921	79,480	$85,786	107,664	$1,113,010	147,000
1922	146,640	172,251	348,838	2,813,946	422,200
1923	205,890	249,993	357,642	3,599,116	460,600
1924	309,010	287,137	328,659	3,209,257	483,200
1925	415,710	375,315	392,145	3,730,509	600,000
1926	511,300	458,802	386,715	3,593,731	642,000
1927	434,160	424,140	374,415	3,459,803	591,000
1928	522,850	509,502	448,761	4,283,036	710,000
1929	516,400	461,444	488,032	4,261,942	746,000
1930	453,350	356,025	351,740	3,045,082	578,000

BASIC MAGNESIUM CARBONATE

Both in England and in the United States the great bulk of the production of basic magnesium carbonate, or "technical carbonate," used in "85 per cent magnesia" pipe and boiler coverings is made from dolomite by the method originally patented by Pattinson. Caustic calcined magnesite and the mother liquor (bitterns) remaining after the extraction of salt from sea water are also employed locally in California as raw materials, but only to a limited extent.

The crude dolomite used for this purpose, whether purchased or quarried by the manufacturers, is reported annually to the Bureau of Mines. On the basis of these figures and including a rough estimate to cover the production from sources other than dolomite, it would appear that the total domestic output of technical carbonate ranges from 50,000 to 75,000 short tons annually. The industry is centered largely in Pennsylvania, New Jersey, Ohio, and California and is closely allied to the manufacture of asbestos goods and other heat-insulating materials.

Dolomite sold or used by producers in the United States for manufacture of basic magnesium carbonate, 1921–1930

Year	Short tons	Value
1921	32,050	$60,648
1922	53,170	79,313
1923	116,410	146,337
1924	98,160	129,390
1925	98,980	131,440
1926	72,850	$110,560
1927	69,940	115,932
1928	94,200	122,260
1929	84,750	129,383
1930	111,740	189,219

HIGH-MAGNESIUM LIME FOR SULPHITE PAPER MILLS

An estimate of the high-magnesium lime sold to sulphite paper mills in the past 10 years is given in the following table. Exact figures are not available, as many lime producers who sell burned lime to paper mills do not specify the kind of paper mill. The quantity sold is expressed as burned lime.

High-magnesium lime sold by producers in the United States to sulphite paper mills 1921–1930

Year	Short tons	Value	Year	Short tons	Value
1921	68, 992	$711, 345	1926	52, 600	$482, 000
1922	70, 000	650, 000	1927	50, 000	441, 000
1923	75, 000	750, 000	1928	46, 000	359, 000
1924	70, 000	625, 000	1929	51, 000	398, 000
1925	53, 000	451, 000	1930	38, 400	295, 000

CARBON DIOXIDE

Sales of crude dolomite for the manufacture of carbon dioxide in the past 10 years were as follows:

Dolomite sold by producers in the United States for the manufacture of carbon dioxide, 1921–1930

Year	Short tons	Value	Year	Short tons	Value
1921	34, 090	$124, 984	1925	19, 740	$36, 854
1922	38, 280	58, 748	1926	16, 520	31, 424
1923	38, 460	52, 494	1927–1930	(1)	(1)
1924	34, 600	57, 105			

(1) Bureau of Mines not at liberty to publish figures for years beginning 1927.

MAGNESIUM

Expectations that 1930 would establish still another high record in the production and sales of magnesium were thwarted by the general business depression during the latter half of the year. Although the industry failed to equal the extraordinary totals of 1929, it did register an increase as compared with 1928. The output of new ingot, amounting to 1,173,557 pounds, was considerably more than double the output in 1928 and only 12 per cent less than that in 1929. The quantity sold or used by the producer in 1930—559,631 pounds, valued at $268,864—although scarcely two-thirds that in 1929, compares favorably with the corresponding quantity—530,782 pounds, valued at $289,658—in 1928.

Two substantial reductions in price were made in 1930. In January the price was 80 cents a pound for lots of 5,000 pounds or over and $1 a pound for 100-pound lots, but from February to November the prices were 65 cents to $1 and in December the price for ordinary quantities (100-pound lots or over) was cut to 48 cents a pound with additional discounts on large contract orders.

Improvements have also been made in methods of fabrication and in the production of magnesium alloys especially adapted for individual commercial purposes. More detailed knowledge of operating conditions required in forging, extrusion, and rolling has eliminated much of the difficulty formerly experienced in obtaining uniform results in the fabrication of magnesium products. The welding of magnesium alloys no longer presents any serious obstacles. Electric spot and seam welds are easily made, and acetylene fusion methods likewise are commercially used. Heat must be regulated rather carefully to avoid too rapid melting of the metal, particularly on thin sections, but special equipment or inert atmospheres are not necessary and several of the standard aluminum fluxes are suitable for use in magnesium welding. The forging problem, another stumbling block in the way of faster development of the industry, has received further study. Magnesium tends to cause red-shortness in aluminum alloys, but suitable forging alloys consisting mainly of magnesium are now available.

DOMESTIC PRODUCTION

In earlier years, when the American magnesium industry was in its infancy, an attempt was made to report the aggregate value of all the various products, including not only ingots but rods, tubing, sheet, powder, and other finished or semifinished forms, all of which were then manufactured almost exclusively in the same establishments in which the virgin ingot was produced. As the industry increased in size, however, it appeared desirable to adopt the usual procedure employed in reporting the output of other metals and to report the production of primary or virgin magnesium metal separately from the manufactured forms. Beginning with 1928, therefore, production data are not strictly comparable with figures for earlier years.

Magnesium metal was first produced commercially in the United States in 1915. Sales of domestic ingots and manufactured forms from 1915 to 1927 and production and sales of domestic ingots from 1928 to 1930 are shown in the two following tables.

Domestic metallic magnesium (ingots, castings, alloys, ribbon, powder, rods, tubes, sheets, etc.) sold or used by producers in the United States, 1915–1927

Year	Pounds	Value	Year	Pounds	Value
1915	87,500	$440,000	1922	[1] 60,000	[1] $89,000
1916	75,400	311,462	1923	[1] 125,000	[1] 155,000
1917	115,813	233,626	1924	[1] 128,000	[1] 150,000
1918	284,118	615,217	1925	245,000	274,400
1919	127,465	247,302	1926	322,650	390,400
1920	123,800	233,200	1927	366,400	441,700
1921	48,000	86,000			

[1] Estimate.

New ingot magnesium produced and sold in the United States, 1928–1930

Year	Produced (pounds)	Sold or used by the producer	
		Pounds	Value
1928	521,075	530,782	$289,658
1929	1,329,669	908,351	512,313
1930	1,173,557	559,631	268,864

DOMESTIC INDUSTRY

Since May, 1927, the entire domestic output of primary magnesium has been supplied by the Dow Chemical Co. from magnesium chloride recovered as a joint product of its salt wells at Midland, Mich. The American Magnesium Corporation, affiliated with the Aluminum Co. of America, formerly produced magnesium by the oxide process but now confines its activities to partial fabrication of the metal in the form of extruded bar, alloys, castings, forgings, sheet, wire, and powder. The Bohn Aluminum & Brass Corporation, of Detroit, Mich., produces magnesium castings and fabricated parts under the trade name "Bohnalite X." A company was organized to manufacture the metal from a dolomite deposit controlled by the Little Flower Mining Co. near Logan, Utah, but no production has been reported from this source.

Although no outstanding new uses for magnesium were developed in 1930 the practical application of magnesium and its alloys continued to expand. By far the bulk of the magnesium sold in the United States is employed for deoxidizing and desulphurizing other metals or as a minor addition in aluminum heat-treated alloys, but other uses are growing in importance. The elimination of bismuth in lead with magnesium gained headway in 1930. In airplane construction magnesium is being used successfully in the production of propellers, and more than 100 such propellers are now used on planes. The high ratio of fatigue endurance to weight as exhibited by certain magnesium alloys is the reason given for their use in propellers and other rapidly rotating parts. Other uses for magnesium in the aircraft industry include fuel tanks, ribs, struts, wheels, furniture, and trimming. Magnesium has been used in the manufacture of artificial limbs and for a variety of special purposes. Most sand castings are made from alloys containing 6 to 8 per cent of aluminum and 0.2 to 0.4 per cent of manganese, but for forging a new alloy has been developed. Another alloy recently placed upon the market contains 1.5 per cent of manganese and is designed especially to resist salt-water corrosion. As its resistance to corrosion is obtained at a slight sacrifice of physical properties it is recommended only for sheet and parts that are not subjected to excessive stresses. Other standard alloys with better physical properties, notably those of the magnesium-aluminum-manganese series, are satisfactory under ordinary atmospheric conditions.

Magnesium wire and ribbon are used largely for the flashing (degasification) of radio tubes. Sheet is employed mainly in radio rectifiers, but sales in 1930 were much smaller than for several years. Sales of powder fell off somewhat, due perhaps to the increasing use of zirconium metal mixtures and special bulbs to be attached to electric lighting circuits. Sales of magnesium ribbon (extruded) for electrical heating appliances held up well. This ribbon is wound around the resister element to be insulated and converted into an insulating film of oxide by means of superheated steam. This type of insulation may be extended to other electrical heating equipment.

The sales of manufactured magnesium as reported by the leading companies for recent years were distributed as follows:

Manufactured magnesium products (other than ingot) sold by producers in the United States, 1926–1930, in pounds

Product	1926	1927	1928	1929	1930
Alloys	6,862	11,835	16,210	13,145	12,297
Castings	36,936	31,992	55,861	116,350	99,443
Powder	31,551	31,658	27,294	35,943	30,331
Wire and ribbon	5,662	4,748	7,695	7,736	7,898
Rod and tubing [1]	614	1,191	719	1,864	115
Sheet	4,198	10,883	8,425	8,512	1,348
Shavings	72	42	810	720	501
Other	------------	21,941	20,218	12,051	13,558
	85,895	114,290	137,232	196,321	165,491
Total value	$199,684	$269,403	$301,346	$393,916	$309,144

[1] Exclusive of extruded rods or ingots sold for metallurgical purposes.

IMPORTS

The imports of magnesium in recent years have consisted mostly of magnesium metal powder. As compared with the domestic output the aggregate quantity recorded under the various import categories is almost negligible.

In the tariff act of 1930 no change was made in the duties on magnesium and its alloys. Under paragraph 375 the rates remain at 40 cents a pound on metallic magnesium and scrap and 40 cents a pound on the magnesium content plus 20 per cent of the foreign market value on powder and other manufactured forms, including alloys.

Magnesium imported for consumption in the United States, 1921–1930

Year	Pounds	Value	Year	Pounds	Value
1921	39,913	$30,592	1926	10,117	$4,750
1922	182,939	54,448	1927	7,131	8,402
1923	13,974	11,576	1928	12,039	11,890
1924	8,738	6,561	1929	3,490	6,539
1925	8,326	7,070	1930	5,689	19,599

Magnesium imported for consumption in the United States, 1929 and 1930, by classes

Class	1929		1930	
	Pounds	Value	Pounds	Value
Alloys (magnesium content)	52	$147	407	$346
Powder (magnesium content)	2,951	5,351	4,144	18,136
Sheets, tubing, ribbons, wire, and all other articles (magnesium content) [1]	487	1,041	1,138	1,117
	3,490	6,539	5,689	19,599

[1] Beginning with new tariff, June 18, 1930, classification reads "Sheets, tubing, ribbons, wire, and other n. s. p. f. (magnesium content)."

FOREIGN INDUSTRY

The I. G. Farbenindustrie A. G. in Germany is the largest producer of magnesium in the world. Its product, mainly in the form of the various "elektron" alloys, is obtained from magnesium chloride. In France a new company was organized in 1930 to undertake the production of the metal and its alloys from molten chloride, produced by treating magnesite with hydrochloric acid which in turn is obtained by the action of hydrogen upon the chlorine released at the anodes of the magnesium cells. The new enterprise appears to be sponsored jointly by the Cie. Alais Froges et Camargue and the Société d'Electro-Chimie et d'Electro-Metallurgie d'Ugine. The plant is at Martigny. In Russia production of the metal on a large scale is contemplated for the near future. The Ukrainian salt-lake deposits are in the region of the Dnieper River hydroelectric plant, and the Soviet Chemical Trust has announced its intention of producing 300 tons of magnesium metal annually. Another plan [11] calls for the construction of a plant to produce ultimately 1,000 tons of metal annually.

MAGNESIUM SALTS

The production of magnesium salts—including magnesium sulphate, chloride, and carbonate—from natural salt and bittern waters in the United States in 1930 was 73,255,090 pounds, valued at $1,071,112, compared with 90,425,360 pounds, valued at $1,081,817, in 1929. As there were less than three producers of each of these compounds, the Bureau of Mines is not at liberty to publish production figures separately.

Magnesium sulphate was produced in the United States in 1930 by the Dow Chemical Co., Midland, Mich., by treatment of the natural chloride bitterns from its salt wells. The ingenious process employed was described in detail in the chapter of this series for 1929. Extensive deposits of epsomite in Okanogan County, Wash., owned by the Magnesia Products Co., Portland, Oreg., which had not been operated for several years, yielded a small production during the summer of 1930. Commercial magnesium chloride (flake), containing 97 per cent of $MgCl_2.6H_2O$, is made by the Dow Chemical Co. and by the California Chemical Corporation. The latter corporation, a subsidiary of the National Kellastone Co. of Chicago and affiliated with the Sierra Magnesite Co., has a plant at Chula Vista, Calif., where it obtains magnesium chloride and bromine from bitterns and natural or artificial brines from salt works. Such bitterns are also sold to the Plant Rubber & Asbestos Co., Redwood City, Calif., for use in the manufacture of technical carbonate. In 1930, the Marine Chemicals Co. (Ltd.), of South San Francisco, Calif., was again active in the production of magnesium carbonate from sea water by its patented process. The Bonneville Development Co. of Salt Lake City, Utah, which has been engaged in development and experimental work, reported that it was in process of being financed for commercial production.

In Canada no activity has been reported in the production of natural magnesium salts since 1923, when 121 short tons of refined magnesium sulphate were shipped from a deposit near Ashcroft, British Columbia. Magnesium sulphate is also found south of Penticton, British Columbia; at Dana, Saskatchewan, there is a large alkaline lake in which this salt is an important constituent of the brine. The Dominion imports a little more than 2,500 tons of Epsom salts annually. Germany is the principal foreign source of the world supply of magnesium salts, producing both the sulphate ("bitter salts") and the chloride as by-products of the potash industry. British India is another large producer. In Russia plans are proposed for exploiting the magnesium contents of salt lakes. In the districts of Genichesk, Perekop, and Odessa, southern Ukraine, a number of such lakes were discovered in 1917. According to estimates mentioned in Soviet journals a "concentrate" containing as high as 81 per cent magnesium chloride may be pumped into railroad tank cars and the entire deposit contains about 1,600,000 tons. The projected utilization of this material for the production of magnesium metal is noted elsewhere in this review. (See p. 200.)

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[11] Economic Review of the Soviet Union, The Soviet Nonferrous Metal Industry: Vol. 6, No. 1, Jan. 1, 1931, p. 11.

The tariff act of 1930 (par. 49) made certain changes in the classification of magnesium chemical compounds. A specific provision was added for manufactures of carbonate of magnesia at 2 cents a pound (previously dutiable at 30 per cent ad valorem under the blanket paragraph covering manufactures of "earthy or mineral substances"). The duty on sulphate or Epsom salts was advanced from ½ to ¾ cent a pound and that on oxide or calcined magnesia from 3½ to 7 cents a pound. The rates on precipitated carbonate (1½ cents a pound) and chlorides (1 cent a pound on anhydrous and ⅝ cent on magnesium chloride, n. s. p. f.) were not changed.

The imports of the principal magnesium salts into the United States in recent years are recorded in the following tables. In addition, 67,524 pounds of magnesium silicofluoride or fluosilicate, valued at $4,195, were imported in 1930, compared with 212,503 pounds, valued at $12,856, in 1929.

Magnesium chloride imported for consumption in the United States, 1921–1930

Year	Anhydrous		Total	
	Pounds	Value	Pounds	Value
1921	(1)	(1)	7, 365, 812	$85, 727
1922	(1)	(1)	11, 403, 837	113, 618
1923	56, 110	$2, 703	23, 052, 385	190, 748
1924	136, 082	1, 820	15, 200, 433	85, 206
1925			15, 922, 254	105, 462
1926			16, 093, 867	110, 477
1927	44, 374	315	8, 185, 363	59, 950
1928	427, 114	3, 125	5, 799, 750	41, 712
1929			3, 291, 856	23, 120
1930	728	215	2, 000, 081	14, 480

[1] Not separately recorded.

Magnesium sulphate (Epsom salts) imported for consumption in the United States, 1921–1930

Year	Pounds	Value	Year	Pounds	Value
1921	12, 519, 778	$88, 153	1926	10, 600, 582	$61, 018
1922	25, 390, 734	200, 203	1927	11, 620, 675	60, 527
1923	14, 455, 920	71, 566	1928	10, 459, 596	61, 600
1924	8, 881, 181	57, 579	1929	13, 541, 189	82, 416
1925	8, 211, 228	50, 466	1930	8, 079, 298	54, 646

Magnesium compounds imported for consumption in the United States, 1921–1930

Year	Calcined magnesia		Carbonate, precipitated		Year	Calcined magnesia		Carbonate, precipitated	
	Pounds	Value	Pounds	Value		Pounds	Value	Pounds	Value
1921	35, 182	$7, 593	18, 514	$2, 061	1926	520, 394	$51, 454	241, 293	$16, 142
1922	96, 792	15, 969	36, 254	3, 385	1927	259, 357	48, 093	348, 383	20, 115
1923	141, 375	30, 802	1, 046, 990	55, 137	1928	300, 897	60, 325	283, 264	17, 512
1924	101, 998	29, 252	481, 439	25, 333	1929	471, 545	83, 866	517, 414	29, 902
1925	162, 790	43, 356	190, 413	13, 004	1930	392, 160	73, 991	446, 981	24, 989

NEW PROCESSES AND PATENTS

The following articles and patents relating to the manufacture of magnesium compounds have appeared recently:

Cambi, Livio. Extraction of magnesia from dolomite. Giorn. Chim. Ind. Appl., vol. 12, pp. 438–441.

Methods of separating magnesium compounds from dolomite (abundant in Italy) are reviewed, particularly Twynam's process using nitric acid and calcined dolomite. Electrometric titration with this acid shows two breaks, calcium nitrate forming first and magnesium nitrate later. These reactions, which take place readily at temperatures above 50° C., afford a method of fractional separation, although the subsequent recovery of the nitric acid from the calcination of the nitrates constitutes a serious problem. A product containing MgO, 98.91 per cent; CaO, 0.39 per cent; and Al_2O_3 and Fe_2O_3, trace, was obtained from dolomite analyzing MgO, 20.78 per cent; CaO, 31.2 per cent; Al_2O_3 and Fe_2O_3, 0.43 per cent; and CO_2, 46.82 per cent.

Collings, W. R., and Shafer, J. J., assignors to the Dow Chemical Co., Midland, Mich. Calcium-magnesium-chloride product and method of making same. U. S. Patent 1738492. Patents issued Dec. 3 to Dec. 17, 1929. Chem. and Met. Eng., vol. 37, No. 1, January, 1930, p. 65.

Curlewis, R. D. Preparation of salts of ammonium and magnesium. British Patent 670364, Feb. 27, 1929. Del., Aug. 17, 1929. Chim. et Ind. (France), vol. 24, No. 2, August, 1930, p. 346.

1. Magnesia is produced by treating magnesite with ammonium sulphate forming magnesium sulphate and ammonium carbonate as by-products. The latter is volatilized and sublimed. The magnesium sulphate is lixiviated, and the residue of magnesium is dried and calcined.

2. The carbon dioxide released in the above reaction may be introduced into the subliming chamber and recovered.

3. Magnesium basic carbonate may be precipitated by the addition of carbonate of soda and converted into the oxide by calcination.

4. Light magnesia is obtained.

5. By re-treating the magnesia, boiling it with sulphate of ammonia, and evacuating the ammonia gas, Epsom salt may be separated.

6. The above process produces an extra-light magnesia, resembling flour.

Griswold, Thomas, jr., and Hunter, R. M., Midland, Mich., assignors to the Dow Chemical Co., Midland, Mich. Making magnesium chloride from chlorine and a magnesium base. U. S. Patent 1756247. Chem. and Met. Eng., vol. 37, No. 5, May, 1930, p. 321.

Hughes, T. Production of normal magnesium carbonate and other magnesium compounds from magnesites. British Patents 320937 (July 26 and Aug. 30, 1928). Brit. Chem. Abs. Acids; alkalis; salts; nonmetallic elements. Chem. and Ind. (London), vol. 49, No. 3, p. 57, Jan. 17, 1930.

Dense, hard magnesite in lumps 6 to 18 inches in length is treated with, e. g., 20 per cent sulphuric acid under conditions such that mechanical disintegration is avoided; after the reaction has proceeded for some time the liquor is circulated through a strainer to remove silica, etc., and then through a series of tanks in which suspended particles of magnesium carbonate settle out; after the addition of some fresh acid, it is returned to the magnesite. The lumps are subsequently washed with magnesium sulphate solution under pressure to remove adhering magnesite particles. The product is suitable for pharmaceutical use, for the manufacture of fireproofing and refractory surfaces, and after grinding in a colloid mill for the manufacture of water or oil paints, etc.

Nishida, K., and Nakamura, S. Causticizing ammonium chloride with magnesium oxide. Rept. Lab. South Manchuria Railway, 1929, pp. 37–39. Chem. and Ind. (London), vol. 49, Dec. 5, 1930, p. 1108.

An attempt to utilize light-burnt magnesite in the place of lime for causticizing ammonium chloride in the Solvay process has shown that the former is weaker than the latter and that for 100 per cent recovery of ammonia the ammonia liquors must be diluted from 3.46N. to 2.34N. From the rate of distillation it is calculated that the amount of fuel required in the magnesite method is thrice that for the lime; hence, the former method is not economical unless the value of the recovered magnesium chloride is sufficient to cover the cost of the fuel.

Platzmann, C. R. Chemistry and physics. Production of magnesia from dolomite. Rock Products, vol. 32 (21), 1929, pp. 75–77. Jour. Am. Ceram. Soc., Abs. Bull., vol. 9, No. 1, January, 1930, p. 64.

By treatment with CO_2 and $KHCO_3$ burned dolomite is split into its constituent parts in such a manner that carbonate of lime is precipitated and $MgCO_3.KHCO_3.xH_2O$ enters in solution. Upon heating the resulting solution to 100° C. elimination of $MgCO_33H_2O$ sets in, from which MgO can be obtained by calcining. The final product obtained is a nearly chemically pure magnesia. The lime residue can be utilized as fertilizer lime. The $KHCO_3$ solution goes back in the process.

Smith, A. K., and Prutton, C. F., East Cleveland, Ohio, assignors to the Dow Chemical Co., Midland, Mich. Method of separating calcium and magnesium chlorides. Chem. and Met. Eng., vol. 37, No. 11, November, 1930, p. 707.

Verein für chemische und metallurgische Produktion, Czechoslovakia. Manufacture of calcium chloride and magnesia. German Patent 488029. Addition to German Patent 422470. October 21, 1924. Chim. et Ind., vol. 24, No. 1, July, 1930, p. 101.

Dolomite is treated with hot magnesium chloride.

ASPHALT AND RELATED BITUMENS[1]

By A. H. Redfield[2]

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SUMMARY TABLES

Supply and distribution of asphalt and related bitumens in the United States, 1927–1930, in short tons

	1927	1928	1929	1930
SUPPLY				
Native asphalt and related bitumens:				
Produced	839,040	807,860	804,027	702,777
Imported (chiefly lake asphalt)	158,097	119,588	121,019	53,197
Petroleum asphalt (excluding road oil):				
Produced at refineries from—				
Domestic petroleum	1,304,522	1,392,355	1,657,295	1,506,277
Foreign petroleum	2,513,017	2,156,172	2,247,460	1,824,089
	3,817,539	3,548,527	3,904,755	3,330,366
Stocks, Jan. 1	242,673	277,197	255,215	276,690
Total supply	5,057,349	4,753,172	5,085,016	4,363,030
DISTRIBUTION				
Native asphalt and related bitumens:				
Indicated domestic demand	799,165	781,597	757,065	679,617
Exports (unmanufactured)	39,875	26,263	46,962	23,160
Petroleum asphalt (excluding road oil):				
Indicated domestic demand (including lake asphalt)	3,556,081	3,197,735	[a] 3,524,895	2,965,726
Exports	385,031	492,362	479,404	410,389
Stocks, Dec. 31	277,197	255,215	[a] 276,690	284,138
Total distribution	5,057,349	4,753,172	5,085,016	4,363,030

[a] Revised figures.

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[1] Work on manuscript completed July, 1931.

[2] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Values of principal items of asphalt and related bitumens industry in the United States, 1927–1930

	1927	1928	1929	1930
Native asphalt and related bitumens:				
Sales	$5,605,850	$5,175,055	$5,470,493	$4,463,092
Imports (chiefly lake asphalt)	1,140,425	865,046	955,606	457,172
Exports (unmanufactured)	1,034,334	683,563	1,133,058	628,673
Petroleum asphalt:				
Sales (including road oil) from—				
Domestic petroleum	19,019,150	22,060,312	24,135,787	21,570,439
Foreign petroleum	35,771,940	30,056,866	27,057,868	21,181,467
Total sales	54,791,090	52,117,178	51,193,655	42,751,906
Exports	8,325,413	9,788,501	8,542,975	7,277,032

NATIVE ASPHALTS AND BITUMENS

BITUMINOUS ROCK

SALES

Sales of native rock asphalt by producers in the United States decreased 11.2 per cent in tonnage and 12.4 per cent in value (from 748,550 short tons, valued at $4,071,173, in 1929 to 664,871 tons, valued at $3,566,595, in 1930). The average value per ton sold decreased from $5.44 in 1929 to $5.36 in 1930. Fully 86.5 per cent of the total tonnage of rock asphalt sold in 1930 was mined in two States—Kentucky and Texas; minor amounts were produced in Alabama, California, Oklahoma, and Utah.

Native asphalt and related bitumens sold at mines in the United States, 1926–1930, by varieties and by States

[Value f. o. b. mine]

	1926		1927		1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Bituminous rock:										
Alabama	22,000	$101,000	32,650	$128,700	110,360	$406,575	77,209	$258,886	79,980	$297,211
Oklahoma	37,010	121,830	42,460	132,380						
California	3,330	19,310								
Kentucky	320,430	2,530,480	344,220	3,156,700	318,548	2,757,547	340,346	2,785,772	305,024	2,374,834
Texas	289,980	825,610	376,770	1,254,500	321,505	815,482	320,931	946,003	270,138	825,460
Utah	-------	---------	-------	---------	10,084	80,672	10,064	80,512	9,729	69,090
Total	672,750	3,598,230	796,100	4,672,280	760,497	4,060,276	748,550	4,071,173	664,871	3,566,595
Gilsonite: Utah	42,190	863,840	42,580	876,820	47,023	1,037,679	54,987	1,235,920	37,684	863,197
Ozokerite: Utah	-------	---------	80	32,000	150	60,000	290	133,400	-------	---------
Wurtzilite: Utah	240	22,890	280	24,750	190	17,100	200	30,000	222	33,300
Grand total	715,180	4,484,960	839,040	5,605,850	807,860	5,175,055	804,027	5,470,493	702,777	4,463,092
RÉSUMÉ BY STATES										
Alabama	22,000	101,000	32,650	128,700	110,360	406,575	77,209	258,886	79,980	297,211
Oklahoma	37,010	121,830	42,460	132,380						
California	3,330	19,310								
Kentucky	320,430	2,530,480	344,220	3,156,700	318,548	2,757,547	340,346	2,785,772	305,024	2,374,834
Texas	289,980	825,610	376,770	1,254,500	321,505	815,482	320,931	946,003	270,138	825,460
Utah	42,430	886,730	42,940	933,570	57,447	1,195,451	65,541	1,479,832	47,635	965,587
Grand total	715,180	4,484,960	839,040	5,605,850	807,860	5,175,055	804,027	5,470,493	702,777	4,463,092

In west-central Kentucky extensive deposits of bituminous sandstone occur in Edmonson, Breckinridge, Grayson, and Hardin Counties in the Pottsville formation of the lower Pennsylvanian series and, to a smaller extent, in the Chester formation of the upper Mississippian. The bituminous sandstone of the Pottsville formation is a coarse-grained, angular, pure quartz sandstone containing 3 or 4 to 15 per cent of bitumen and averaging about 7.9 per cent. The bituminous member of the Chester formation, known as the Cypress sandstone, is of finer grain than the Pottsville sandstone and contains 6.8 to 10 per cent—an average of 8.2 per cent—of bitumen.

At Kyrock and at Asphalt in Edmonson County bituminous sandstone of the Pottsville formation is quarried throughout the year in large open pits, crushed, pulverized, mixed by machinery, and delivered by conveyor belts to barges. The prepared rock asphalt is floated down Nolin and Green Rivers and up Barren River to Bowling Green on the Louisville & Nashville Railroad, a distance of 71 miles, or down Barren River to Rockport on the Illinois Central Railroad, a total distance of 95 miles.

At Summit, Hardin County, bituminous sandstone of upper Mississippian age is quarried, crushed, pulverized, and loaded directly on cars of the Illinois Central Railroad for shipment. Similar quarries of rock asphalt are operated along the Illinois Central Railroad at Big Clifty, Grayson County. When shipped by rail, rock asphalt is loaded into open-top gondola cars, from which it may be unloaded by steam shovels or picks and shovels.

Shipments of rock asphalt down Nolin and Green Rivers and up or down Barren River amounted to 317,110 short tons in 1929 and 242,119 tons in 1930, a decrease of 23.6 per cent, according to statistics issued by the Board of Engineers for Rivers and Harbors, United States Army. No statistics of rail shipments of Kentucky rock asphalt are available.

Sales of bituminous sandstone in Kentucky, quarried in Edmonson, Hardin, and Grayson Counties, decreased 10.4 per cent in quantity (from 340,346 short tons in 1929 to 305,024 tons in 1930) and 14.8 per cent in value (from $2,785,772 in 1929 to $2,374,834 in 1930). The average value realized per ton sold decreased from $8.19 in 1929 to $7.79 in 1930.

Four companies produced rock asphalt in Kentucky in 1930: The Crown Rock Co., operating near Leitchfield, Grayson County; the Kentucky Rock Asphalt Co., operating at Kyrock, Edmonson County; the Natural Rock Asphalt Corporation, operating at Natural Rock, Edmonson County; and the Ohio Valley Rock Asphalt Co., operating near Leitchfield, Grayson County, and Elizabethtown, Hardin County.

According to data furnished by the producers to the Bureau of the Census, of the 340,346 short tons of bituminous sandstone sold by producers in Kentucky in 1929, 48.5 per cent was sold directly to Government agencies (State, municipal, and local), 35.3 per cent directly to private contractors, 12.4 per cent through agents, and the remainder chiefly to railroads and public utilities.

As shipped, Kentucky rock asphalt contains an average of 7 per cent of bitumen. The prepared rock may be laid cold, preferably on a dry, swept surface. In loose condition it weighs 2,160 pounds per cubic yard. When compacted by a roller to a thickness of 1½ inches, 1 ton of prepared Kentucky rock asphalt will surface 15 square yards. One square yard of loose rock asphalt, 2¼ inches thick or compacted by a roller to 1½ inches, weighs about 133 pounds.

In Uvalde and Kinney Counties, Tex., the coarse-grained Anacacho limestone of Upper Cretaceous age is impregnated irregularly with 10 to 25 per cent of bitumen. It is suggested[3] that the voids in this porous shell limestone became filled with petroleum distilled by the heat of basalt intrusions from underlying bituminous shales. The petroleum is supposed to have been bituminized by the chemical action of sulphate waters or hydrogen sulphide gas.

The bituminous Anacacho limestone has been quarried for many years in Uvalde and Kinney Counties, near Cline and near Blewett. After the overburden of soil has been removed by drag lines the asphalt rock is drilled and blasted down. The blasted rock is loaded by steam shovels into standard-gage railroad cars and hauled to a central crushing plant. After crushing, the rock is screened, hand sorted, pulverized, mixed, blended with asphaltic flux oil for laying by the cold process, and loaded by bucket conveyors into open-top railroad cars for shipment.[4] The finished product contains, on an average, 10 per cent of asphalt.

Sales of limestone rock asphalt in Texas, quarried in Uvalde and Kinney Counties, fell off 15.8 per cent in quantity (from 320,931 short tons in 1929 to 270,138 tons in 1930) and 12.7 per cent in value (from $946,003 in 1929 to $825,460 in 1930). Demand was less active than in 1929, but the prices realized were slightly higher. The average sales value per ton increased 3.7 per cent (from $2.95 in 1929 to $3.06 in 1930).

According to data supplied by the producers to the Bureau of the Census, of the 320,931 short tons of limestone rock asphalt sold by producers in Texas in 1929, 84.6 per cent was sold by producers directly to contractors engaged in State, municipal, and private road construction and 12.2 per cent by branches or subsidiaries of the producers.

In Colbert County, Ala., the bituminous oolitic Gasper limestone, of middle Mississippian age, has been quarried on a small scale 1 mile south of Margerum by the Alabama Rock Asphalt (Inc.), of Birmingham, Ala., and 2 miles southeast of Cherokee by the Dixie Minerals Corporation, of Pittsburgh. After the 3 to 4 foot overburden has been removed the oolitic limestone, 15 to 30 feet thick and containing 2.5 to 9.5 per cent of bitumen, is quarried, crushed, and hand sorted. The rock containing more bitumen is enriched by the addition of 4 to 5 per cent of petroleum asphalt flux and sold for paving, by either the hot or the cold process; the leaner material is sold merely as crushed rock. A bituminous sandstone of the underlying Bethel formation (middle Mississippian), 10 feet thick and containing 7.5 to 9.1 per cent of bitumen, has been mined intermittently near Cherokee, Colbert County.

In the Arbuckle Mountains of south-central Oklahoma rock asphalt has been mined for many years near Dougherty, Murray County. In the Sand mine 3 miles northeast of Dougherty a nearly horizontal bed of fine rounded sand grains cemented with asphalt, belonging to the Simpson formation of the Lower and Middle Ordovician, is mined in an open quarry by the Western Paving Co., of Oklahoma City. After an overburden of 20 to 30 feet of shale and conglomerate has been removed the sandstone, 30 to 35 feet thick and containing an average of 9.57 per cent of bitumen, is quarried along a 100-foot face. In the Rock mine 1 mile northeast of Dougherty beds of the Viola limestone, of Middle Ordovician age and containing 4.25 per cent of bitumen, are quarried along a 90-foot face by the same company. The bituminous limestone is crushed and mixed with asphaltic sand from the Sand mine, and the resulting mixture is sold for paving streets and surfacing highways. The prepared rock asphalt is shipped in open cars over the Gulf, Colorado & Santa Fe Railway.[5]

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[3] Baker, C. L., Possible Distillation of Oil from Organic Sediments by Heat and Other Processes of Intrusions. Asphalt in the Anacacho formation of Texas: Am. Assoc. Petrol. Geol. Bull., vol. 12, October, 1928, pp. 995-1003.

[4] Vivian, C. H., Quarrying Rock Asphalt in Texas: Compressed Air Mag., vol. 35, September, 1930, pp. 3244-3247.

In northeastern Utah beds of bituminous sandstone 1,000 feet thick have been known for many years to exist in the Book Cliffs of the West Tavaputs Plateau near Sunnyside, Carbon County. From 1891 to 1905 rock asphalt from these deposits was used intermittently to surface streets in Salt Lake City. Mining on a commercial basis was begun in 1928 by the Utah Rock Asphalt Corporation, of Pueblo, Colo. The asphalt-bearing sandstone belonging to the Wasatch formation of Eocene age is a pure silica sand containing 7 to 13 per cent of bitumen. After 10 to 30 feet of overburden have been removed by steam shovels the bituminous sandstone is drilled and blasted down in benches 6 to 8 feet wide, loaded into 5-ton loading pockets, lowered 3,000 feet over a 3-mile rope tramway to the terminal base in Whitmore Canyon, and hauled by trucks 2 miles to the mill at Sunnyside. The rock—crushed, pulverized, mixed, and moistened to prevent sticking together—is shipped over the Denver & Rio Grande Western Railroad in open cars.[6]

Beds of bitumen-saturated sandstone, chiefly of Eocene age, outcropping near Vernal, Uintah County, Utah, have been described by Spieker.[7] Bituminous rock from these beds was used in 1924 to pave the streets of Vernal, Utah, but the deposits have not been exploited commercially.

On the coast of California, about 5 miles northwest of Santa Cruz, gently dipping beds of porous, loose sandstone at the base of the Monterey shale (Miocene), 50 feet thick and impregnated with bitumen, have been mined and sold for paving material. The rock asphalt, as shipped, may be laid cold. At Benham, 2 miles southeast of Carpinteria, Santa Barbara County, Pleistocene sand saturated with asphalt apparently derived from the underlying Monterey formation has been quarried and sold for many years.

DOMESTIC DEMAND

The indicated domestic demand for natural rock asphalt, calculated by subtracting exports from the total sales of natural rock asphalt, decreased from 701,588 short tons in 1929 to 641,711 tons in 1930.

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[5] Hutchinson, L. L., Preliminary Report on the Rock Asphalt, Asphaltite, Petroleum, and Natural Gas in Oklahoma: Oklahoma Geol. Survey Bull. 2, 1911, pp. 44-61.

Shelley, P. G., Accelerated Weathering Properties of Oklahoma Asphalts: Oklahoma Geol. Survey Circ. 19, 1929, 36 pp.

Snider, L. C., Rock Asphalts of Oklahoma and Their Use in Paving: Oklahoma Geol. Survey Circ. 5, 1913, 22 pp.

Wolfard, N. E., Native Road Materials and Highway Maintenance: Oklahoma Geol. Survey Circ. 20, 1929, 42 pp.

[6] Martin, Gail, Rock Asphalt Mining: Eng. and Min. Jour., vol. 130, Oct. 9, 1930, pp. 339-340.

[7] Spieker, E. M., Bituminous Sandstone near Vernal, Utah: U. S. Geol. Survey Bull. 822-C, 1930, pp. 77-98.

EXPORTS

Less than half as much natural rock asphalt was exported from the United States in 1930 as in 1929. Exports decreased from 46,962 short tons in 1929 to 23,160 tons in 1930; the value of these exports decreased 44.5 per cent (from $1,133,058 in 1929 to $628,673 in 1930). The decrease was due chiefly to the drop in exports of rock asphalt to Italy, from the abnormally high amount of 14,181 tons in 1929 to a normal amount of 550 tons in 1930. Important decreases occurred also in exports to the Irish Free State, Canada, and Brazil; these decreases were offset in part only by increased shipments to Mexico, France, and Japan.

Native asphalt and bitumen (unmanufactured) exported from the United States, 1928–1930, by countries

Country	1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value
Canada	6,386	$124,380	5,293	$117,234	2,769	$67,952
Cuba	365	5,188	703	14,778	197	3,289
Mexico	552	4,552	125	1,604	1,469	5,950
Brazil	1,621	29,977	2,517	49,215	22	652
Chile	377	7,167	11	278	18	729
Belgium	342	8,826	454	10,208	363	11,510
France	1,699	56,634	2,894	106,238	3,098	113,637
Germany	5,370	180,627	5,756	189,851	5,524	160,442
Irish Free State	140	1,700	4,628	82,640	34	663
Italy	405	12,414	14,181	307,193	550	15,738
Netherlands	529	22,087	418	14,145	384	11,358
Spain	746	18,797	533	11,184	676	10,733
United Kingdom	3,659	115,068	6,274	142,373	6,253	165,972
Japan	277	13,047	274	12,699	691	26,821
Australia	129	4,060	1,333	40,045	160	4,887
Other countries	3,666	79,039	1,568	33,373	952	28,340
	26,263	683,563	46,962	1,133,058	23,160	628,673

GILSONITE

Sales of gilsonite, mined in the Uinta Basin of northeastern Utah, decreased 31.5 per cent in quantity (from 54,987 short tons in 1929 to 37,684 tons in 1930) and 30.2 per cent in value (from $1,235,920 in 1929 to $863,197 in 1930). The average sales value per ton increased 1.9 per cent (from $22.48 in 1929 to $22.91 in 1930). The sales values as stated above for both 1929 and 1930, however, include the value reported by one producer for gilsonite delivered at the consumer's plant, hundreds of miles distant from the mine. The actual sales value obtained by the other producers, f. o. b. mine or railroad shipping point, averaged $21.58 per ton in 1930, an increase of 3.9 per cent over the average of $20.76 per ton in 1929.

Four companies mined gilsonite in northeastern Utah in 1930: The American Asphalt Association, St. Louis, operating near Dragon, Uintah County; the Gilson Asphaltum Co., Philadelphia, operating near Watson, Uintah County; the Raven Mining Co. of Utah, Chicago, operating in Duchesne and Uintah Counties near Roosevelt; and the Utah Gilsonite Co., St. Louis, operating near Watson, Uintah County. The mine near Fort Duchesne, Uintah County, operated by the Diamond Gilsonite Co., was sold on July 1, 1930, to the Utah Gilsonite Co.

OZOKERITE

No ozokerite was produced in the United States in 1930. Falling prices and decreased demand for mineral waxes made it unprofitable to work the veins of ozokerite which cut the Tertiary beds of the Uinta Basin near Soldier Summit, Utah. On the other hand, imports of mineral wax increased 27.4 per cent in quantity (from 9,791,090 pounds in 1929 to 12,474,894 pounds in 1930) but only 17.2 per cent in value (from $616,617 in 1929 to $722,426 in 1930). The average declared import value per pound decreased 7.9 per cent (from $0.063 in 1929 to $0.058 in 1930). Included in the imports of mineral waxes are not only ozokerite and its refined form, ceresine, but also much montan wax, derived from the distillation of lignite.

Ozokerite and other mineral waxes imported for consumption in the United States, 1921–1930

Year	Pounds	Value	Year	Pounds	Value
1921	8,548,542	$546,054	1926	8,287,397	$479,957
1922	8,989,972	371,161	1927	7,599,708	579,118
1923	4,856,357	213,407	1928	10,901,389	594,416
1924	3,113,819	207,833	1929	9,791,090	616,617
1925	6,175,184	361,767	1930	12,474,894	722,426

ICHTHYOL

Since 1922 no bituminous rock has been mined in the United States for the manufacture of ichthyol. Imports of ichthyol into the United States for consumption decreased from 32,529 pounds, valued at $42,066, in 1929 to 20,980 pounds, valued at $29,272, in 1930.

PRODUCERS

Production of native asphalts and related bitumens was reported in this country in 1930 by the following operators:

Alabama Rock Asphalt (Inc.), 310 Pioneer Building, Birmingham, Ala.
American Asphalt Association, 919 Wainwright Building, St. Louis, Mo.
Calrock Asphalt Co., 525 Market Street, San Francisco, Calif.
Crown Rock Co., Blymyer Building, Cincinnati, Ohio.
Dixie Minerals Corporation, 702 Empire Building, Pittsburgh, Pa.
Gilson Asphaltum Co., 1600 Arch Street, Philadelphia, Pa.
Kentucky Rock Asphalt Co., 711–718 Marion E. Taylor Building, Louisville, Ky.
Natural Rock Asphalt Corporation, 1210 Heyburn Building, Louisville, Ky.
Ohio Valley Rock Asphalt Co., Starks Building, Louisville, Ky.
Raven Mining Co. of Utah, 140 South Dearborn Street, Chicago, Ill.
D. A. Sattler, Box 233, Carpinteria, Calif.
Standard Rock Asphalt Co., 601 Brady Building, San Antonio, Tex.
Texas Rock Asphalt Co., 928 North Flores Street, San Antonio, Tex.
Utah Gilsonite Co., Wainwright Building, St. Louis, Mo.
Utah Rock Asphalt Corporation, 732 Thatcher Building, Pueblo, Colo.
Uvalde Rock Asphalt Co., 510 Frost National Bank Building, San Antonio, Tex.
Western Paving Co., 1519 Petroleum Building, Oklahoma City, Okla.
White's Uvalde Mines, 1901–1909 Alamo National Bank Building, San Antonio, Tex.

WORLD PRODUCTION

The United States is the largest producer of natural rock asphalt in the world. Its production averages more than double that of Italy, its nearest competitor, and four and one-half times that of Germany, which occupies third place.

Trinidad, on the other hand, with its famous Pitch Lake near Brighton, leads the world in the production of native asphalts of a high degree of purity. It is followed by Venezuela, whose Bermudez Lake near Guanoco, State of Sucre, is almost equally well known. The United States owed its position as third in rank in 1926 to 1928 to the production of gilsonite, wurtzilite, and ozokerite in Utah.

Asphalt rock, natural asphalt, and related bitumens produced in the principal producing countries, 1926–1930, in metric tons[1]

[Compiled by M. T. Latus, of the Bureau of Mines]

Country and mineral[2]	1926	1927	1928	1929	1930
ASPHALT ROCK					
Albania	3,860	3,283	2,277	2,512	(3)
Canada (Alberta)[4]	479	2,455	85	897	1,807
France	58,240	61,000	65,293	63,690	56,548
Germany	60,966	117,836	158,329	145,341	(3)
Greece	402	290	3,173	1,196	(3)
Italy	312,790	356,154	242,300	219,584	224,034
Netherland East Indies	155	1,340	1,050	15,030	8,778
Rumania	24,891	30,712	8,875	----------	23,820
Russia[5]	30,606	48,378	48,620	(3)	(3)
Spain	5,856	4,514	7,735	9,002	9,480
United States	610,305	722,206	689,908	679,070	603,158
Yugoslavia	85	142	535	61	246
NATURAL ASPHALT AND RELATED BITUMENS					
Barbados[6]	109	46	60	51	10
Cuba	7,988	4,116	13,186	10,695	16,064
France	27	14	15	(3)	(3)
Italy	735	791	2,178	919	291
Peru	690	892	981	950	(3)
Poland[7]	723	736	767	835	902
Russia[5] [7]	955	843	710	(3)	(3)
Switzerland[8]	28,200	36,716	21,321	20,009	(3)
Trinidad	241,109	246,017	199,125	223,128	160,393
United States	38,492	38,954	42,967	50,328	34,388
Venezuela	51,552	56,906	48,749	27,915	(3)

[1] Minerals included are asphalt rock, bituminous rock used for other purposes than the extraction of oil, native asphalt, asphaltite, manjak, and ozokerite. Oil shales, including ichthyolic shale, are not included.

[2] In addition to those listed the following countries are reported to produce asphalt and related bitumens, but figures of annual output are not available: Colombia, Iraq, Madagascar, and Syria.

[3] Data not available.

[4] Bituminous sands.

[5] Year ended Sept. 30.

[6] Exports of manjak.

[7] Ozokerite.

[8] Exports.

MANUFACTURED OR PETROLEUM ASPHALT

GENERAL STATEMENT

Curtailment of production and imports to meet reduced consumption, both domestic and foreign, resulted in an approximate balance of supply and demand in the petroleum asphalt industry over the Nation as a whole. The domestic demand for petroleum and lake asphalt in the United States in 1930 fell 15.9 per cent short of the demand in 1929 and 7.3 per cent short of the demand in 1928. The production of asphalt by petroleum refineries in 1930 was 14.7 per cent less than in 1929 and 6.1 per cent less than in 1928. Imports, chiefly of lake asphalt and grahamite, were less than half as large in 1930 as in 1929. As production and imports were curtailed to meet the reduced demand stocks of petroleum asphalt held at refineries were only 3 per cent larger on December 31, 1930, than on December 31, 1929. Prices of all grades of petroleum asphalt averaged 5.6 per cent less in 1930 than in 1929. Exports of petroleum asphalt in 1930, especially to northern and western Europe and to the Far East, were 14.4 per cent lower in 1930 than in 1929.

REFINERY PRODUCTION

The refinery production of petroleum asphalt (exclusive of road oil) in 1930 fell 14.7 per cent short of the output in 1929 and 6.1 per cent short of that in 1928. Production decreased from 3,548,527 short tons in 1928 and 3,904,755 tons in 1929 to 3,330,366 tons in 1930. The principal decreases took place in the East coast district, which produced 1,770,906 tons in 1929 and 1,506,900 tons in 1930; in the Indiana-Illinois district, which produced 688,842 tons in 1929 and 485,891 tons in 1930; in the Gulf coast of Louisiana, which produced 459,149 tons in 1929 and 312,065 tons in 1930; and in the California district, which produced 659,226 tons in 1929 and 629,548 tons in 1930. On the other hand, production of petroleum asphalt in northern Louisiana and Arkansas increased from 45,670 tons in 1929 to 103,348 tons in 1930 and in the Appalachian district from 26,743 tons in 1929 to 44,805 tons in 1930.

Asphalt (exclusive of road oil) produced at petroleum refineries in the United States, 1926–1930, by districts, in short tons [1]

District	1926	1927	1928	1929	1930
East coast	1,520,322	1,846,282	1,691,653	1,770,906	1,506,900
Appalachian	5,114	6,471	7,981	26,743	44,805
Indiana-Illinois	264,418	402,321	418,681	688,842	485,891
Oklahoma-Kansas-Missouri	16,025	5,370	9,665	27,793	29,743
Texas:					
Gulf coast	275,859	373,933	207,700	216,336	210,305
Rest of State	2	------------	728	580	239
Total Texas	275,861	373,933	208,428	216,916	210,544
Louisiana-Arkansas:					
Louisiana Gulf coast	605,418	602,066	562,300	459,149	312,065
Northern Louisiana and Arkansas	21,551	19,566	15,443	45,670	103,348
Total Louisiana and Arkansas	626,969	621,632	577,743	504,819	415,413
Rocky Mountain	37,021	26,221	14,296	9,510	7,522
California	495,367	535,309	620,080	659,226	629,548
Grand total	3,241,097	3,817,539	3,548,527	3,904,755	3,330,366

[1] These figures, compiled directly from returns made by petroleum refineries producing asphalt, differ from the statistics of asphalt production published on p. 74 of the Asphalt chapter of Mineral Resources of the United States in 1927, and in Petroleum Refinery Statistics, 1927, 1928, and 1929 (Bureau of Mines Bulletins 297, 318, and 339) chiefly because of the differences in classification. In the monthly and annual refinery statements some of the more liquid products are listed under "All other finished products."

SOURCE OF RAW MATERIAL

Less asphalt was made from foreign petroleum in 1930 than in 1929 or 1928. Of the 3,330,366 short tons of petroleum asphalt manufactured in 1930, 1,824,089 tons were made from crude oil imported chiefly from Venezuela, Mexico, and Colombia, compared with 2,247,460 tons made from foreign oil in 1929 and 2,156,172 tons in 1928. The percentage of the total made from foreign crude decreased from 60.8 per cent in 1928 and 57.6 per cent in 1929 to 54.8 per cent in 1930. The decrease of 18.8 per cent in the production of asphalt from foreign crude in 1930 compared with 1929 was in keeping with the decrease of 19.4 per cent in the runs of foreign crude to stills (from 75,517,000 barrels in 1929 to 60,832,000 barrels in 1930).

Of the 1,824,089 tons of asphalt made from foreign crude in 1930, 1,479,793 tons, or 81.1 per cent, were manufactured in refineries of the Atlantic seaboard and 344,296 tons, or 18.9 per cent, in refineries of coastal Louisiana and Texas. In the East coast district, 98.6 per cent of the total asphalt production in 1929 and 98.2 per cent of that in 1930 were made from foreign crude oil, although only 40 per cent of the crude run to stills on the Atlantic seaboard in 1929 and 49.5 per cent of that in 1930 were of foreign origin. In the Gulf coast district, 74.1 per cent of the total asphalt produced in 1929 and 65.9 per cent of that in 1930 were made from foreign raw material, although foreign crude formed only 4.5 per cent of the total crude oil run to stills on the Gulf coast in 1929 and only 2 per cent of that in 1930.

Foreign crude petroleum run to stills at refineries in the United States, 1929 and 1930, in thousands of barrels

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1929													
East coast	5,687	5,319	5,630	5,424	6,039	6,294	5,856	5,588	5,495	5,233	5,171	4,511	66,247
Texas Gulf coast	100	37	118	403	473	469	219	338	112	138	167	299	2,873
Louisiana Gulf coast	639	723	866	833	692	528	338	364	384	297	360	373	6,397
	6,426	6,079	6,614	6,660	7,204	7,291	6,413	6,290	5,991	5,668	5,698	5,183	75,517
1930													
East coast	4,726	4,158	4,249	4,686	5,078	4,946	5,078	5,220	4,684	4,998	4,679	4,531	57,033
Texas Gulf coast	183	148	83	66	92	70	89	130	79	56	36	18	1,050
Louisiana Gulf coast	204	185	258	259	448	237	238	284	145	219	129	143	2,749
	5,113	4,491	4,590	5,011	5,618	5,253	5,405	5,634	4,908	5,273	4,844	4,692	60,832

GEOGRAPHIC LOCATION OF MANUFACTURE

Little change occurred in the relative importance of the various producing districts from 1929 to 1930. Refineries of the East coast district still furnished the major part of the national production, supplying 45.4 per cent of the national total in 1929 and 45.2 per cent in 1930. Four-fifths of the asphalt production of the East coast district came from refineries located near New York, Philadelphia, and Baltimore. The share of the Gulf coast refineries near New Orleans, Baton Rouge, and Port Arthur, Tex., in the national production decreased from 17.3 per cent in 1929 to 15.7 per cent in 1930. In the Indiana-Illinois district, refineries located chiefly near Chicago and East St. Louis produced 17.6 per cent of the national total in 1929 but only 14.6 per cent in 1930. On the other hand, California refineries located near San Francisco and Los Angeles made 16.9 per cent of all asphalt (exclusive of road oil) manufactured in the United States in 1929 and 18.9 per cent in 1930.

SEASONAL VARIATION IN MANUFACTURE

In 1930, as in the previous five years, about 60 per cent of the total output of asphalt was produced in the six months from May 1 to October 31. The highest output for any single month in 1930 was that in June, closely followed by August. A higher percentage of the annual total was produced in the first and second quarters of 1930 and a lower percentage in the third and fourth quarters of 1930 than the average for similar periods in the previous five years. These percentages are based on production data published monthly and annually by the Bureau of Mines in its Petroleum Refinery Statistics. Owing to differences in the classification of asphaltic products, they cover only about 97.7 per cent of the total production of asphalt (exclusive of road oil) recorded on page 213; nevertheless, they are believed to indicate with reasonable accuracy the trend of monthly production.

Per cent of asphalt produced in petroleum refineries in the United States, 1926–1930, by months

Month	1926	1927	1928	1929	1930	5-year average
January	5.6	5.6	6.1	5.4	6.5	5.8
February	5.2	5.1	6.3	6.0	5.9	5.7
March	7.2	6.5	8.0	6.6	6.7	7.0
April	6.8	8.0	8.3	8.2	8.3	7.9
May	8.5	9.3	10.0	9.1	10.5	9.5
June	10.3	10.1	10.0	9.4	10.7	10.1
July	9.6	9.8	10.0	11.1	10.3	10.2
August	10.5	9.9	9.6	10.9	10.7	10.3
September	10.5	9.8	9.3	10.5	9.4	9.9
October	11.1	9.7	9.7	10.3	9.4	10.0
November	7.4	8.5	7.4	7.1	6.5	7.4
December	7.3	7.7	5.3	5.4	5.1	6.2
	100.0	100.0	100.0	100.0	100.0	100.0

REFINERY STOCKS

Stocks of petroleum asphalt held at refineries increased from 276,690 short tons on December 31, 1929, to 284,138 tons on December 31, 1930, a gain of 3 per cent. In terms of the indicated domestic demand during 1929, the stocks held on December 31, 1929, amounted to 28.7 days' supply; in terms of the indicated domestic demand during 1930, the stocks held on December 31, 1930, amounted to 35 days' supply. The chief additions to storage took place in the California district, where stocks increased 25.8 per cent during 1930; other increases in stocks took place in the minor producing districts. East coast refineries, on the other hand, reduced their stocks of asphalt 1.9 per cent; Indiana-Illinois refineries, 6.6 per cent; Gulf coast refineries of Louisiana, 9.6 per cent; and Gulf coast refineries of Texas, 13.7 per cent.

Production, stocks, and sales of asphalt (exclusive of road oil) at petroleum refineries in the United States in 1930, by districts, in short tons

District	Production	Stocks		Sales
		Dec. 31, 1929	Dec. 31, 1930	
East coast	1,506,900	[1]92,528	90,815	1,508,613
Appalachian	44,805	3,666	9,551	38,920
Indiana-Illinois	485,891	75,805	70,831	490,865
Oklahoma-Kansas-Missouri	29,743	3,436	5,549	27,630
Texas:				
Gulf coast	210,305	13,903	11,992	212,216
Rest of State	239	42	78	203
Total Texas	210,544	13,945	12,070	212,419
Louisiana-Arkansas:				
Louisiana Gulf coast	312,065	[1]45,336	40,967	316,434
Northern Louisiana and Arkansas	103,348	[1]5,252	7,983	100,617
Total Louisiana and Arkansas	415,413	[1]50,588	48,950	417,051
Rocky Mountain	7,522	2,973	3,917	6,578
California	629,548	33,749	42,455	620,842
Grand total	3,330,366	[1]276,690	284,138	3,322,918

[1] Revised figures.

SALES BY USES

Sales of petroleum asphalt at refineries were 14.5 per cent lower in 1930 than in 1929. They decreased from 3,888,642 short tons in 1929 to 3,322,918 tons in 1930. Sales of most types of asphalt were less in 1930 than in 1929; the greatest actual decreases occurred in sales of paving asphalt, roofing asphalt, roofing flux, miscellaneous solid and semisolid asphalts, and paving flux. In contrast to the general tendency to decrease, sales of cut-back asphalts doubled in quantity from 1929 to 1930.

The values realized by the sales of petroleum asphalt decreased 19.5 per cent (from $43,889,434 in 1929 to $35,341,117 in 1930). The average sales value per ton of asphaltic products, other than road oil, decreased 5.8 per cent (from $11.29 in 1929 to $10.64 in 1930). The principal decreases in sales took place in paving asphalt, which sold at an average value per ton of $12.45 in 1929 and $11.03 in 1930; in roofing asphalt, which sold at $11.01 in 1929 and $10.74 in 1930; in paving flux, which sold at $14.85 in 1929 and $10.29 in 1930; and in roofing flux, which sold at $9.14 in 1929 and $9.08 in 1930.

Asphalt and asphaltic material (exclusive of road oil) sold at petroleum refineries in the United States, 1929 and 1930, by varieties

[Value f. o. b. refinery]

	From domestic petroleum		From foreign petroleum		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1929						
Solid and semisolid products of less than 200 penetration:[1]						
Asphalt for—						
Paving	547,176	$7,194,382	979,223	$11,806,133	1,526,399	$19,000,515
Roofing	601,155	6,461,699	451,507	5,128,156	1,052,662	11,589,855
Waterproofing	43,192	629,209	62,249	742,508	105,441	1,371,717
Blending with rubber	2,481	67,168	22,843	250,703	25,324	317,871
Briquetting	53,367	551,483	11,768	145,224	65,135	696,707
Mastic and mastic cake	1,364	23,686	425	6,395	1,789	30,081
Pipe coatings	7,868	125,282	4,914	74,586	12,782	199,868
Molding compounds	40	1,004	2,239	23,991	2,279	24,995
Miscellaneous uses	128,540	854,651	80,565	350,073	209,105	1,204,724
	1,385,183	15,908,564	1,615,733	18,527,769	3,000,916	34,436,333
Semisolid and liquid products of more than 200 penetration:[1]						
Flux for—						
Paving	54,332	563,298	130,924	2,187,394	185,256	2,750,692
Roofing	86,552	797,807	328,431	2,994,305	414,983	3,792,112
Waterproofing	22,515	225,776	----------	----------	22,515	225,776
Mastic	----------	----------	82	678	82	678
Cut-back asphalts	21,801	314,842	107,894	1,359,404	129,695	1,674,246
Emulsified asphalts and fluxes	148	5,320	14,662	175,944	14,810	181,264
Paints, enamels, japans, and lacquers	----------	----------	210	6,653	210	6,653
Other liquid products	79,856	412,188	40,319	409,492	120,175	821,680
	265,204	2,319,231	622,522	7,133,870	887,726	9,453,101
Grand total	1,650,387	18,227,795	2,238,255	25,661,639	3,888,642	43,889,434
1930						
Solid and semisolid products of less than 200 penetration:[1]						
Asphalt for—						
Paving	520,499	5,895,157	843,132	9,151,821	1,363,631	15,046,978
Roofing	498,779	5,310,126	343.976	3,739,603	842,755	9,049,729
Waterproofing	38,193	547,385	43,827	502,775	82,020	1,050,160
Blending with rubber	3,715	74,171	17,844	191,765	21,559	265,936
Briquetting	46,148	441,289	11,493	140,226	57,641	581,515
Mastic and mastic cake	1,497	26,315	758	9,023	2,255	35,338
Pipe coatings	7,722	111,259	2,701	35,876	10,423	147,135
Molding compounds	60	1,356	165	1,780	225	3,136
Miscellaneous uses	46,734	499,535	61,368	367,361	108,102	866,896
	1,163,347	12,906,593	1,325,264	14,140,230	2,488,611	27,046,823
Semisolid and liquid products of more than 200 penetration:[1]						
Flux for—						
Paving	53,726	582,934	62,959	618,187	116,685	1,201,121
Roofing	82,631	610,908	232,639	2,252,999	315,270	2,863,907
Waterproofing	----------	----------	1,131	8,850	1,131	8,850
Mastic	----------	----------	353	2,610	353	2,610
Cut-back asphalts	66,586	835,543	195,047	2,283,305	261,633	3,118,848
Emulsified asphalts and fluxes	7,560	115,204	6,489	62,979	14,049	178,183
Paints, enamels, japans, and lacquers	----------	----------	3,185	31,594	3,185	31,594
Other liquid products	115,381	827,882	6,620	61,299	122,001	889,181
	325,884	2,972,471	508,423	5,321,823	834,307	8,294,294
Grand total	1,489,231	15,879,064	1,833,687	19,462,053	3,322,918	35,341,117

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[1] DEFINITIONS

Paving asphalt.—Refined asphalt and asphaltic cement, fluxed and unfluxed, produced for direct use in the construction of sheet asphalt, asphaltic concrete, asphalt macadam, and asphalt block pavements, and also for use as joint filler in brick, block, and monolithic pavements. (Footnote continued on p. 218.)

Paving asphalt gained somewhat in relative importance over roofing asphalt from 1929 to 1930, constituting 39.3 per cent of the total tonnage of asphalt (exclusive of road oil) sold in the United States in 1929 and 41 per cent in 1930. Roofing asphalt decreased in relative importance from 27.1 per cent of the total in 1929 to 25.4 per cent in 1930.

Paving asphalt accounted for the larger part of the income derived from asphalt sales, furnishing 43.3 per cent of the total in 1929 and 42.5 per cent in 1930. Roofing asphalt yielded 26.4 per cent of the total returns from asphalt sales in 1929 and 25.5 per cent in 1930.

PAVING

Sales of solid and semisolid asphalt for paving declined from 1,526,399 short tons in 1929 to 1,363,631 tons in 1930, a decrease of 10.7 per cent. The decreases were general throughout the refining districts. The values realized by sales of paving asphalt decreased 20.8 per cent (from $19,000,515 in 1929 to $15,046,978 in 1930). The average price obtained per ton decreased from $12.45 in 1929 to $11.03 in 1930.

Four refining districts furnished 95 per cent of the paving asphalt sold in the United States in 1930. Refineries of the East coast district supplied 54.8 per cent of the paving asphalt sold in 1929 and 53.7 per cent in 1930. Gulf coast refineries of Louisiana and Texas furnished 17.4 per cent of the national total in 1929 and 17.5 per cent in 1930. California refineries sold 23 per cent of the total in 1929 and 20.9 per cent in 1930. Of the paving asphalt sold in the United States, only 3.2 per cent in 1929 and only 2.9 per cent in 1930 came from refineries of the Indiana-Illinois district.

Complete statistics of road building and street paving in 1930 are not yet available. According to statistics compiled by the Bureau of Public Roads, Department of Agriculture, of the 8,847 miles of hard-surfaced State highway, new and reconstructed, built in 1929, 1,758 miles, or 19.9 per cent of the total, were surfaced with bituminous compounds. Of the 10,787 miles of hard-surfaced State highway, new and reconstructed, built in 1930, 1,970 miles, or 18.3 per cent of the total, were surfaced with bituminous macadam or bituminous concrete. On the Federal-aid highways bituminous types of surfacing constituted 19.7 per cent of the total mileage of hard-surfaced roads constructed and reconstructed in the calendar year 1928, 32 per cent

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[1] DEFINITIONS—continued

Roofing asphalt.—Asphalt and asphaltic cement used in saturating, coating, and cementing felt or other fabric and in the manufacture of asphalt shingles.

Waterproofing asphalt.—Asphalt and asphaltic cement used to waterproof and dampproof tunnels, foundations of buildings, retaining walls, bridges, culverts, etc., and for constructing built-up roofs.

Briquetting asphalt.—Asphalt and asphaltic cement used to bind coal dust or coke breeze into briquets.

Mastic and mastic cake.—Asphalt and asphaltic cement for laying foot pavements and floors, waterproofing railway bridges, lining reservoirs and tanks, capable of being poured and smoothed by hand troweling.

Pipe coatings.—Asphalt and asphaltic cement used to protect metal pipes from corrosion.

Molding compounds.—Asphalts used in the preparation of molding compositions, such as battery boxes, electrical fittings, push buttons, knobs, handles, etc.

Miscellaneous uses.—Asphalt and asphaltic cement used as dips, and in the manufacture of acid-resisting compounds, putty, saturated building paper, fiber board and floor coverings, and not included in the preceding definitions.

Flux.—Liquid asphaltic material used in softening native asphalt or solid petroleum asphalt for paving, roofing, waterproofing, and other purposes.

Cut-back asphalts.—Asphalts softened or liquefied by mixing them with petroleum distillates.

Emulsified asphalts and fluxes.—Asphalts and fluxes emulsified with water for cold patching, road laying, and other purposes.

Other liquid products.—Petroleum asphalt, exclusive of fuel oil used for heating purposes, not included in the preceding definitions.

in 1929, and 22.4 per cent in 1930. Decreases in the mileage of bituminous concrete and bituminous macadam highway built during 1930, compared with 1929 and 1928, were in large part offset by increases in the use of low-cost bituminous types of surfacing, first employed in 1929. The foregoing statistics by no means present a complete picture of the existing trend, as much paving asphalt is consumed in building county and local roads and in laying, repairing, and maintaining city streets. No statistics of highways built by counties, townships, and local governments in 1930 or of street paving in incorporated cities and towns in 1930 are at present available.

Net mileage of hard-surfaced Federal-aid highways completed in calendar years 1928–1930, by types of construction[1]

	1928	1929	1930
Bituminous concrete	241.1	954.0	129.0
Bituminous macadam	502.0		306.3
Low-cost bituminous types		563.6	814.1
Total bituminous	743.1	1,517.6	1,249.4
Other hard-surfaced types[2]	3,019.5	3,219.4	4,340.1
Total hard-surfaced	3,762.6	4,737.0	5,589.5

[1] Source: Bureau of Public Roads, Department of Agriculture.
[2] Includes Portland cement concrete, brick, block, and stone.

Prices of paving asphalt were lower in 1930 than in 1929. The average value per short ton of all solid and semisolid asphalts sold in the United States for paving was $12.45 in 1929 and $11.03 in 1930. In the East coast district the average value declined from $12.15 in 1929 to $10.92 in 1930; in the Gulf coast district, from $13 in 1929 to $12.16 in 1930; in the Indiana-Illinois district, from $10.19 in 1929 to $9.44 in 1930; and in California, from $12.98 in 1929 to $11.54 in 1930.

Sales of paving flux decreased 37 per cent in quantity (from 185,256 short tons in 1929 to 116,685 tons in 1930) and 56.3 per cent in value (from $2,750,692 in 1929 to $1,201,121 in 1930). The principal decreases were as follows: In the East coast district, from 95,221 tons in 1929 to 49,558 tons in 1930; in the Gulf coast district, from 42,236 tons in 1929 to 25,166 tons in 1930; and in the Indiana-Illinois district, from 14,491 tons in 1929 to 3,630 tons in 1930. On the other hand, sales of paving flux in California increased from 32,721 tons in 1929 to 38,128 tons in 1930.

ROOFING

Decreased activity in building throughout the United States resulted in lowered demand for asphalt from the roofing industry. A drop of 30.1 per cent in factory shipments of prepared roofing in 1930, compared with 1929, was reflected in a decrease of 19.9 per cent in refinery sales of roofing asphalt and of 24 per cent in sales of roofing flux over the same period. Sales of roofing asphalt fell from 1,052,662 short tons in 1929 to 842,755 tons in 1930. The decreases were general but were proportionately greatest in the Gulf coast district, where sales of roofing asphalt decreased 42.4 per cent, and in the Indiana-Illinois district, where sales decreased 24.8 per cent.

Despite a decrease of one-fourth in sales of roofing asphalt refineries of the Indiana-Illinois district continued to furnish one-third of all roofing asphalt sold in the United States; their share of the national total was 34.3 per cent in 1929 and 32.2 per cent in 1930. As sales of roofing asphalt by refineries of the East coast decreased only 6.3 per cent their share in the national total increased from 26.6 per cent in 1929 to 31.1 per cent in 1930. Similarly, as sales of roofing asphalt by California refineries decreased only 5.7 per cent, their share in the national total increased from 14.2 per cent in 1929 to 16.8 per cent in 1930. On the other hand, refineries of the Gulf coast, which furnished 28.8 per cent of the national output in 1928 and 18.9 per cent in 1929, supplied only 13.6 per cent of the total in 1930.

Prices of roofing asphalt decreased generally over the country. The average sales value realized per short ton was $11.01 in 1929 and $10.74 in 1930. The average value in the East coast district declined from $12.76 in 1929 to $11.07 in 1930; in the Indiana-Illinois district, from $8.15 in 1929 to $7.94 in 1930; and in California, from $16.98 in 1929 to $16.04 in 1930. On the other hand, the average sales value in the Gulf coast district rose from $10.22 in 1929 to $11.21 in 1930.

Sales of roofing flux in the United States amounted to 414,983 short tons, valued at $3,792,112, in 1929 and 315,270 tons, valued at $2,863,907, in 1930, a decrease of 24 per cent in quantity and 24.5 per cent in value. East coast refineries furnished 56.3 per cent of these sales in 1929 and 56.4 per cent in 1930. The share furnished by Gulf coast refineries decreased from 25.2 per cent in 1929 to 17.4 per cent in 1930, while that furnished by Indiana-Illinois refineries increased from 14.8 per cent in 1929 to 19.1 per cent in 1930. Refineries in California sold 3.7 per cent of the total in 1929 and 2.5 per cent in 1930. The average sales value per short ton of all roofing flux sold in the United States was $9.14 in 1929 and $9.08 in 1930.

MINOR USES

Sales of waterproofing asphalt amounted to 105,441 short tons, valued at $1,371,717, in 1929 and 82,020 tons, valued at $1,050,160, in 1930, a decrease of 22.2 per cent in quantity and 23.4 per cent in value. The tonnage of waterproofing asphalt sold in the East coast district increased slightly from 1929 to 1930, so that the share of the district in the diminished total sales of 1930 was 51.5 per cent, compared with 39.6 per cent in 1929. On the other hand, the share of the Gulf coast district in the total decreased from 35.1 per cent in 1929 to 25 per cent in 1930 and the share of California, from 25.3 per cent in 1929 to 23.5 per cent in 1930.

Sales of waterproofing flux decreased from 22,515 short tons, valued at $225,776, in 1929 to only 1,131 tons, valued at $8,850, in 1930.

Sales of asphalt for blending with rubber decreased 14.9 per cent in quantity (from 25,324 short tons in 1929 to 21,559 tons in 1930) and 16.3 per cent in value (from $317,871 in 1929 to $265,936 in 1930). Eighty-nine per cent of the total tonnage sold in 1929 and 82 per cent of that sold in 1930 came from East coast refineries. The average sales value per ton over the United States decreased from $12.55 in 1929 to $12.34 in 1930. In the East coast district, however, the average sales value increased from $10.90 in 1929 to $10.69 in 1930.

Asphalt sold as a binder for molding coal dust or coke breeze into briquets amounted to 65,135 short tons, valued at $696,707, in 1929 and 57,641 tons, valued $581,515, in 1930, a decrease of 11.5 per cent in quantity and 16.5 per cent in value. The greater part of the briquetting asphalt sold in the United States in 1929 and 1930 was manufactured in the Indiana-Illinois district.

In contrast to the general decrease in asphalt sales, sales of mastic, mastic cake, and mastic flux were larger in 1930 than in 1929. Sales of asphalt mastic and mastic cake by petroleum refineries amounted to 1,789 short tons, valued at $30,081, in 1929 and 2,255 tons, valued at $35,338, in 1930. In addition, 82 tons of mastic flux, valued at $678, were sold by petroleum refineries in 1929 and 353 tons valued at $2,610, in 1930.

Asphalt sold for coating pipes to protect them from rust and corrosion amounted to 12,782 short tons, valued at $199,878, in 1929 and 10,423 tons, valued at $147,135, in 1930, a decrease of 18.5 per cent in quantity and 26.4 per cent in value. These figures refer only to sales by petroleum refineries and do not include pipe coatings made by other manufacturers from asphalts purchased from the petroleum refineries. No statistics of this secondary manufacture of asphaltic pipe coatings are at present available.

Asphalt mixed variously with resins, vulcanized rubber, and fibers is molded into electric fittings, push buttons, knobs, handles, joints, washers, battery boxes, and many other small articles, as well as artificial lumber and flooring planks. Sales of asphaltic molding compounds in the United States decreased from 2,279 short tons, valued at $24,995, in 1929 to 225 tons, valued at $3,136, in 1930.

Increased building of secondary roads throughout the United States and consequent greater demand for easily applied surface dressings for such roads doubled the sales of cut-back asphalts (from 129,695 short tons, valued at $1,674,246, in 1929 to 261,633 tons, valued at $3,118,848, in 1930). East coast refineries furnished 74.5 per cent of the total in 1929 and 61.9 per cent in 1930, and Gulf coast refineries furnished 8.7 per cent of the total in 1929 and 12.7 per cent in 1930.

Refinery sales of asphalt and fluxes emulsified with water amounted to 14,810 short tons, valued at $181,264, in 1929 and 14,049 tons, valued at $178,183, in 1930. These figures, however, include only a small fraction of the total sales of emulsified asphalts and fluxes in the United States. Industrial concerns manufacturing asphalt emulsions from asphalt purchased from petroleum refineries sold 11,330,167 gallons (about 48,153 short tons), valued at $1,306,226, in 1929 and 23,626,145 gallons (100,411 tons), valued at $2,514,745, in 1930. The largest of these secondary manufacturers of emulsified asphalts are located near San Francisco, Los Angeles, Cincinnati, Philadelphia, New York, and Cleveland. Other plants emulsifying asphalt purchased from petroleum refineries are situated near Chicago, Boston, and Syracuse. The total sales of emulsified asphalts in the United States increased 81.8 per cent in quantity (from 62,963 short tons in

1929 to 114,460 tons in 1930) and 81 per cent in value (from $1,487,490 in 1929 to $2,692,928 in 1930). The average sales value remained constant at 10 cents per gallon.

Sales of asphaltic paints, varnishes, and lacquers by petroleum refineries increased from 210 short tons, valued at $6,653, in 1929 to 3,185 tons, valued at $31,594, in 1930. These figures do not include paints, varnishes, and lacquers made by industrial concerns from asphalt purchased from refineries and sold to consumers by these secondary manufacturers. No statistics of the manufacture or sale of asphaltic paints, varnishes, and lacquers by these secondary producers are at present available.

Sales of miscellaneous solid and semisolid asphalts decreased from 209,105 short tons, valued at $1,204,724, in 1929 to 108,102 tons, valued at $866,896, in 1930. On the other hand, sales of miscellaneous semisolid and liquid asphalts increased from 120,175 short tons, valued at $821,680, in 1929 to 122,001 tons, valued at $889,181, in 1930. Among the miscellaneous uses for which solid and semisolid asphalts were sold in 1930 were blending and tempering other asphalts, coating and insulating compounds, dips, paint fillers, moisture proofing, putties and acid-resisting compounds, saturated floor coverings, building papers, and fiber board, and sealing storage batteries; at the same time, semisolid and liquid asphalts were sold for coating railroad rails, preservative coatings of various kinds, roofers' lap cement, waterproofing Portland cement concrete, and preserving railroad ties and other timbers.

SALES BY DISTRICTS

EAST COAST DISTRICT

Forty-five per cent of all asphalt (exclusive of road oil) sold in the United States in 1929 and in 1930 came from refineries situated along the Atlantic seaboard. The largest of these are located near New York, Philadelphia, and Baltimore. Others are located near Boston, Providence, Norfolk, Charleston, S. C., and Savannah and Brunswick, Ga.

Sales of asphalt (other than road oil) by refineries of the East coast district amounted to 1,758,021 short tons, valued at $20,921,605, in 1929 and 1,508,613 tons, valued at $16,308,186, in 1930, a decrease of 14.2 per cent in quantity and 22.1 per cent in value. Sales of paving asphalt decreased 12.5 per cent in tonnage from 1929 to 1930; sales of roofing asphalt, 6.3 per cent; sales of paving flux, 48 per cent; and sales of roofing flux, 23.9 per cent. On the other hand, sales of cut-back asphalts were 67.6 per cent greater in 1930 than in 1929, and sales of waterproofing asphalt and briquetting asphalt increased slightly.

Paving asphalt continued to be the leading product sold by East coast refineries. It constituted 47.6 per cent of all asphalt sold in this district in 1929 and 48.5 per cent in 1930 and furnished 48.6 per cent of the total value realized from asphalt sales in 1929 and 49 per cent in 1930. Second in importance was roofing asphalt, which made up 15.9 per cent of the total tonnage sold by East coast refineries in

1929 and 17.4 per cent in 1930 and yielded 17.1 per cent of the total income derived from asphalt sales by East coast refineries in 1929 and 17.8 per cent in 1930. Roofing flux formed 13.3 per cent of the total tonnage of asphalt sold in the East coast district in 1929 and 11.8 per cent in 1930 and brought in 10.8 per cent of the total sales income in 1929 and 10.5 per cent in 1930. Paving flux constituted 5.4 per cent of the total tonnage sold in 1929 but only 3.3 per cent in 1930 and contributed 8.7 per cent of the total revenue from asphalt sales in 1929 but only 3 per cent in 1930. Cut-back asphalts almost doubled in relative importance (from 5.5 per cent of the total tonnage in 1929 to 10.7 per cent in 1930 and from 5.8 per cent of the total value in 1929 to 11.5 per cent in 1930).

Asphalt and asphaltic material (exclusive of road oil) sold at petroleum refineries of the East coast district, 1929 and 1930, by varieties

	1929		1930	
	Short tons	Value	Short tons	Value
Solid and semisolid products of less than 200 penetration:				
Asphalt for—				
Paving	837,012	$10,170,549	731,967	$7,991,150
Roofing	279,769	3,568,458	262,098	2,901,028
Waterproofing	41,758	494,090	42,230	467,000
Blending with rubber	22,651	246,856	17,699	189,156
Briquetting	11,182	135,218	11,353	134,570
Miscellaneous uses	86,219	437,916	37,988	397,882
	1,278,591	15,053,087	1,103,335	12,080,786
Semisolid and liquid products of more than 200 penetration:				
Flux for—				
Paving	95,221	1,816,133	49,558	490,710
Roofing	233,841	2,262,399	177,905	1,716,215
Cut-back asphalts	96,564	1,210,164	161,860	1,868,201
Other liquid products	53,804	579,822	15,955	152,274
	479,430	5,868,518	405,278	4,227,400
Grand total	1,758,021	20,921,605	1,508,613	16,308,186

GULF COAST DISTRICT

Refineries in coastal Louisiana and Texas near New Orleans, Baton Rouge, and Port Arthur, Tex., sold 17.5 per cent of the total tonnage of asphalt (exclusive of road oil) marketed in the United States in 1929 but only 15.9 per cent in 1930. Sales of petroleum asphalt by Gulf coast refineries amounted to 679,054 short tons valued at $7,699,132, in 1929 and 528,650 tons, valued at $5,939,373, in 1930, a decrease of 22.1 per cent in quantity and 22.9 per cent in value. The decreases were general; only cut-back asphalts showed any considerable increase in sales in 1930 over 1929.

Paving asphalt continued to increase in relative importance, constituting 39.2 per cent of the total tonnage sold by Gulf coast refineries in 1929 and 45.2 per cent in 1930 and furnishing 45 per cent of the total sales income during 1929 and 48.9 per cent in 1930. On the other hand, roofing asphalt decreased in relative importance from 29.3 per cent of the total tonnage sold in 1929 to 21.7 per cent in 1930 and from 26.4 per cent of the total value realized in 1929 to 21.6 per cent in 1930.

Asphalt and asphaltic materials (exclusive of road oil) sold at petroleum refineries of the Gulf coast district, 1929 and 1930, by varieties

	1929		1930	
	Short tons	Value	Short tons	Value
Solid and semisolid products of less than 200 penetration:				
Asphalt for—				
Paving	266,237	$3,461,044	238,760	$2,904,296
Roofing	199,146	2,035,368	114,628	1,284,531
Waterproofing	36,970	485,844	20,538	280,764
Pipe coatings	5,417	82,129	3,051	42,720
Miscellaneous uses	11,868	187,634	36,544	165,637
	519,638	6,252,019	413,521	4,677,948
Semisolid and liquid products of more than 200 penetration:				
Flux for—				
Paving	42,236	469,132	25,166	292,186
Roofing	104,381	815,796	54,953	539,077
Cut-back asphalts	11,330	149,240	33,187	415,104
Other liquid products	1,469	12,945	1,823	15,058
	159,416	1,447,113	115,129	1,261,425
Grand total	679,054	7,699,132	528,650	5,939,373

INDIANA-ILLINOIS DISTRICT

Sales of asphalt (exclusive of road oil) by refineries in the Indiana-Illinois district decreased 21.4 per cent in tonnage and 24.7 per cent in value (from 624,780 short tons, valued at $5,547,834, in 1929 to 490,865 tons, valued at $4,176,112, in 1930). The average sales value per ton decreased 4.2 per cent (from $8.88 in 1929 to $8.51 in 1930).

More than two-thirds of the asphalt produced by Indiana-Illinois refineries is consumed by the roofing factories of the Ohio Valley States. Sales of roofing asphalt amounted to 360,968 short tons, or 57.8 per cent of the total tonnage of asphalt sold in the Indiana-Illinois district, in 1929 and 271,408 tons, or 55.3 per cent of the total sold, in 1930. Sales of roofing flux amounted to 61,287 tons, or 9.8 per cent of the total asphalt sold, in 1929, and 60,084 tons or 12.2 per cent of the total sold, in 1930. The return from sales of roofing asphalt was $2,941,654, or 53 per cent of the total return from sales of asphalt, in 1929 and $2,156,261, or 51.6 per cent of the total, in 1930. Sales of roofing flux yielded $504,551, or 9.1 per cent of the total income from asphalt sales, in 1929 and $457,572, or 11 per cent of the total, in 1930.

Asphalt and asphaltic material (exclusive of road oil) sold at petroleum refineries of the Indiana-Illinois district, 1929 and 1930, by varieties

	1929		1930	
	Short tons	Value	Short tons	Value
Solid and semisolid products of less than 200 penetration:				
Asphalt for—				
Paving	48,098	$490,126	38,961	$367,611
Roofing	360,968	2,941,654	271,408	2,156,261
Miscellaneous uses	103,443	1,020,991	74,048	627,571
	512,509	4,452,771	384,417	3,151,443
Semisolid and liquid products of more than 200 penetration:				
Flux for—				
Paving	14,491	113,717	3,630	25,409
Roofing	61,287	504,551	60,084	457,572
Other liquid products	36,493	476,795	42,734	541,688
	112,271	1,095,063	106,448	1,024,669
Grand total	[1] 624,780	5,547,834	490,865	4,176,112

[1] Does not include 53,233 short tons of asphalt consumed by the producing companies.

CALIFORNIA DISTRICT

Sales of asphalt (exclusive of road oil) by California refineries decreased 7.1 per cent in tonnage and 14.4 per cent in value (from 668,321 short tons, valued at $8,668,712, in 1929, to 620,842 tons, valued at $7,422,173, in 1930). The principal decrease (19.1 per cent) was in sales of paving asphalt. Sales of roofing asphalt decreased 5.7 per cent.

Roofing asphalt continued to gain in relative importance at the expense of the paving grade. For example, paving asphalt constituted 52.6 per cent of the tonnage of asphalt sold by California refineries in 1929 but only 45.9 per cent in 1930 and 52.7 per cent of the total revenue derived from asphalt sales in 1929 but only 44.3 per cent in 1930. On the other hand, sales of roofing asphalt brought in 29.3 per cent of the total income from asphalt sales in 1929 and 30.5 per cent in 1930.

Asphalt and asphaltic material (exclusive of road oil) sold at petroleum refineries of the California district, 1929 and 1930, by varieties

	1929		1930	
	Short tons	Value	Short tons	Value
Solid and semisolid products of less than 200 penetration:				
Asphalt for—				
Paving	351,765	$4,564,548	284,752	$3,285,743
Roofing	149,852	2,544,222	141,250	2,266,299
Waterproofing	26,710	391,732	19,252	302,396
Miscellaneous uses	17,087	277,081	12,635	246,867
	545,414	7,777,583	457,889	6,101,305
Semisolid and liquid products of more than 200 penetration:				
Flux for—				
Paving	32,721	343,608	38,128	390,023
Roofing	15,474	209,366	7,767	64,078
Other liquid products	74,712	338,155	117,058	866,767
	122,907	891,129	162,953	1,320,868
Grand total	668,321	8,668,712	620,842	7,422,173

DISTRIBUTION BY RAIL

Producers shipped less asphalt by rail in 1930 than in 1929. Shipments of asphalt (natural, by-product, or petroleum) originating on Class I railroads in the United States amounted to 3,196,392 short tons in 1929 and 2,937,949 tons in 1930, a decrease of 8.1 per cent. The principal decrease was in the Eastern district, chiefly on the Pennsylvania, the Central Railroad of New Jersey, the Elgin, Joliet & Eastern, the Lehigh Valley, and the New York, New Haven & Hartford. On the other hand, shipments originating on the New York Central and the Baltimore & Ohio increased considerably. Much of the apparently large increase in asphalt billed by shippers over the New York Central system, however, is due to the inclusion in that system in 1930 of the Michigan Central and the Big Four lines, which were operated in 1929 as separate railroads. Actually, the combined systems carried original shipments of 89,227 tons in 1929 and 151,991 tons in 1930.

The smaller tonnage of asphalt shipments originating on Class I railroads in the Southern district may be ascribed chiefly to a decrease in shipments from the Gulf coast refineries of Louisiana over the Yazoo and Mississippi Valley and to a less extent to decreased shipments over the Atlantic Coast Line, the Louisville & Nashville, and the Seaboard Air Line. On the other hand, shipments of asphalt originating on the Illinois Central, the Chesapeake & Ohio, the Norfolk & Western, and the Southern increased considerably.

Asphalt (natural, by-product, or petroleum) shipments originating on Class I railroads in the United States, 1927–1930, by regions, in short tons[1]

Region	1927	1928	1929	1930
Eastern district:				
New England	139,795	157,588	173,353	172,600
Great Lakes	162,517	192,961	217,654	333,693
Central Eastern	1,096,610	1,247,480	1,539,635	1,282,386
Total Eastern district	1,398,922	1,598,029	1,930,642	1,788,679
Southern district:				
Pocahontas	25,119	35,399	47,551	85,185
Southern	899,224	668,452	571,334	467,979
Total Southern district	924,343	703,851	618,885	553,164
Western district:				
Northwestern	61,529	19,669	29,933	42,251
Central Western	289,931	286,533	338,516	299,235
Southwestern	495,171	291,244	278,416	254,620
Total Western district	846,631	597,446	646,865	596,106
Total United States	3,169,896	2,899,326	3,196,392	2,937,949

[1] Source: Freight Commodity Statistics, Interstate Commerce Commission.

Asphalt (natural, by-product, or petroleum) shipments originating on Class I railroads in the United States, 1927–1930, in short tons[1]

	1927	1928	1929	1930
Eastern district:				
Baltimore & Ohio	202,640	227,349	247,580	265,037
Central of New Jersey	326,773	359,019	379,521	351,298
Elgin, Joliet & Eastern	68,966	89,958	142,169	117,134
Lehigh Valley	122,753	118,781	116,872	98,269
New York Central	20,801	34,638	41,294	[2] 151,991
New York, New Haven & Hartford	138,604	147,478	167,729	155,285
Pennsylvania	310,899	325,843	366,694	300,315
Other railroads	207,486	294,963	468,783	[2] 349,350
Total Eastern district	1,398,922	1,598,029	1,930,642	1,788,679
Southern district:				
Atlantic Coast Line	82,385	64,744	35,671	17,401
Chesapeake & Ohio	1,058	692	3,121	22,395
Illinois Central	119,302	63,570	85,777	127,317
Louisville & Nashville	199,299	79,843	25,835	11,030
Norfolk & Western	15,292	24,732	30,939	49,223
Seaboard Air Line	52,296	26,384	28,880	14,295
Southern	53,919	44,867	65,742	83,149
Yazoo & Mississippi Valley	359,131	358,117	306,181	196,269
Other railroads	41,661	40,902	36,739	32,085
Total Southern district	924,343	703,851	618,885	553,164
Western district:				
Atchison, Topeka & Santa Fe	49,594	48,104	50,970	31,632
Chicago & Alton	51,296	75,552	116,475	107,971
Chicago & North Western	52,757	6,680	6,207	11,829
Chicago, Burlington & Quincy	41,131	29,933	41,482	40,042
Great Northern	370	2,436	9,073	16,773
Gulf, Colorado & Santa Fe	28,108	819	720	342
Louisiana & Arkansas	3,213	6,846	54,088	62,856
Louisiana Railway & Navigation Co	37,105	67,837	40	----------
Missouri Pacific	3,801	9,722	23,055	44,775
San Antonio, Uvalde & Gulf	219,680	41,788	23,402	631
Southern Pacific (Pacific lines)	137,356	104,392	107,755	98,190
Southern Pacific (lines in Texas and Louisiana)	39,634	5,287	4,498	1,677
Texarkana & Fort Smith	137,671	136,368	144,752	111,505
Other railroads	44,915	61,682	64,348	67,883
Total Western district	846,631	597,446	646,865	596,106
Total United States	3,169,896	2,899,326	3,196,392	2,937,949

[1] Freight Commodity Statistics, Interstate Commerce Commission. In the statistics for 1928, 1929, and 1930 the material carried was designated as "asphalt (natural, by-product, or petroleum)"; in those for 1927, merely as "asphaltum."

[2] Figures for the New York Central system include in 1930 asphalt shipments originating on the Cleveland, Cincinnati, Chicago & St. Louis ("Big Four"), Cincinnati Northern, and Michigan Central, which formerly were operated as separate systems. Shipments originating on these roads in 1927 to 1929 are included under "Other railroads."

The principal decreases in asphalt shipments originating on Class I railroads in the Western district were on the Texarkana & Fort Smith, the San Antonio, Uvalde & Gulf, the Southern Pacific (Pacific lines), and the Chicago & Alton.

One-tenth less asphalt was delivered to destination by railroads in 1930 than in 1929. The total tonnage of asphalt (natural, by-product, or petroleum) terminated by Class I railroads in the United States decreased from 3,284,364 short tons in 1929 to 2,959,665 tons in 1930. Except in the Pocahontas region, the decrease was general over the United States; it was greatest, however, in the Eastern district.

The principal decreases in the tonnage of asphalt terminated were in the Central Eastern region, notably by the Baltimore & Ohio, the Elgin, Joliet & Eastern, and the Pennsylvania. In the Great Lakes region less asphalt was carried to destination by the New York, Chicago & St. Louis, the Pere Marquette, and the Erie. In New England the tonnage of asphalt set down by the New York, New Haven & Hartford was also lower. The apparent increase in asphalt terminated by the New York Central was due to the inclusion in the New York Central system in 1930 of the Michigan Central, the Big Four, and the Cincinnati Northern, which were operated in 1929 as separate railroads. Actually, the combined tonnage of asphalt delivered by the New York Central and its subsidiaries to destinations on their lines decreased from 343,967 short tons in 1929 to 309,897 tons in 1930.

In contrast to the general decreases in asphalt terminated in the United States, all four of the railroad systems which constitute the Pocahontas region delivered more asphalt to consumers in 1930 than in 1929. Most of the increase, however, was on the Chesapeake & Ohio and the Norfolk & Western.

In the Southern region the chief decreases in asphalt terminated were by the Yazoo & Mississippi Valley, the Atlantic Coast Line, the Nashville, Chattanooga & St. Louis, and the Seaboard Air Line; on the other hand, more asphalt was set down in 1930 than in 1929 by the Illinois Central, the Louisville & Nashville, the Southern, and the Florida East Coast.

West of the Mississippi River the chief decreases in asphalt terminated were in the Central Western region. Smaller tonnages of asphalt were delivered to destination in 1930 than in 1929 by the Atchison, Topeka & Sante Fe, the Chicago, Rock Island & Pacific, the Southern Pacific, the Los Angeles & Salt Lake, and the Chicago & Alton.

In the Northwestern region the principal decreases in asphalt terminated were by the Chicago Great Western, the Chicago, Milwaukee, St. Paul & Pacific, and the Great Northern; on the other hand, the tonnages of asphalt set down by the Chicago & North Western and the Northern Pacific on their own lines were considerably larger in 1930 than in 1929.

In the Southwestern region the tonnage of asphalt terminated by the Missouri Pacific and its subsidiaries decreased from 75,830 short tons in 1929 to 65,657 tons in 1930. Decreases also occurred in the tonnages of asphalt delivered to destination by the Kansas City Southern system, the Missouri-Kansas-Texas, and the Louisiana & Arkansas. On the other hand, the tonnage terminated by the St. Louis Southwestern system increased considerably.

Asphalt (natural, by-product, or petroleum) terminated by Class I railroads in the United States, 1928–1930, by regions, in short tons[1]

Region	1928	1929	1930
Eastern district:			
New England	208,773	230,281	226,945
Great Lakes	631,319	716,873	700,729
Central Eastern	933,113	1,095,102	870,584
Total Eastern district	1,773,205	2,042,256	1,798,258
Southern district:			
Pocahontas	29,459	42,406	72,347
Southern	451,470	419,527	412,987
Total Southern district	480,929	461,933	485,334
Western district:			
Northwestern	141,684	199,648	177,354
Central Western	367,674	362,054	299,454
Southwestern	223,583	218,473	199,265
Total Western district	732,941	780,175	676,073
Total United States	2,987,075	3,284,364	2,959,665

[1] Source: Freight Commodity Statistics, Interstate Commerce Commission.

Asphalt (natural, by-product, or petroleum) terminated by Class I railroads in the United States, 1928–1930, in short tons[1]

	1928 (total)	1929 (total)	1930		
			Originating on carriers' lines	Received from connecting carriers	Total
Eastern district:					
Baltimore & Ohio	229,712	252,212	97,378	96,781	194,159
Central of New Jersey	58,786	56,875	51,776	3,868	55,644
Chicago & Eastern Illinois	45,657	30,698	721	56,280	57,001
Cleveland, Cincinnati, Chicago & St. Louis	46,327	60,265	(2)	(2)	(2)
Elgin, Joliet & Eastern	88,770	110,383	34,932	22,949	57,881
Erie	128,069	155,425	5,861	136,693	142,554
Lehigh Valley	70,233	47,928	21,577	19,761	41,338
Long Island	41,983	49,785	15,706	37,685	53,391
Michigan Central	57,709	54,976	(2)	(2)	(2)
New York Central	177,177	204,761	[2] 69,948	[2] 228,742	[2] 298,690
New York, Chicago & St. Louis	23,889	58,322	2,276	39,488	41,764
New York, New Haven & Hartford	161,359	180,302	135,893	32,252	168,145
Pennsylvania	345,338	370,403	216,033	118,261	334,294
Other railroads	298,196	409,921	51,081	302,316	353,397
Total Eastern district	1,773,205	2,042,256	703,182	1,095,076	1,798,258
Southern district:					
Atlantic Coast Line	37,633	23,588	8,233	7,459	15,692
Florida East Coast	31,512	32,016	1,434	36,836	38,270
Illinois Central	113,143	121,703	59,354	88,200	147,554
Louisville & Nashville	35,169	28,689	3,741	32,647	36,388
Mobile & Ohio	33,964	12,432	90	6,196	6,286
Nashville, Chattanooga & St. Louis	14,237	34,427	38	26,741	26,779
Norfolk & Western	13,426	22,622	10,828	25,450	36,278
Southern	52,191	50,796	27,341	30,755	58,096
Yazoo & Mississippi Valley	43,230	43,936	25,590	3,520	29,110
Other railroads	106,424	91,724	14,350	76,531	90,881
Total Southern district	480,929	461,933	150,999	334,335	485,334
Western district:					
Atchison, Topeka & Santa Fe	66,056	61,450	28,886	17,250	46,136
Chicago & Alton	65,982	65,729	50,314	9,077	59,391
Chicago & North Western	28,604	36,164	7,962	35,773	43,735
Chicago, Burlington & Quincy	22,562	24,347	7,857	15,648	23,505
Chicago Great Western	8,019	16,230	427	3,774	4,201
Chicago, Milwaukee, St. Paul & Pacific	33,520	44,917	2,553	30,546	33,099
Chicago, Rock Island & Pacific	72,146	55,806	4,279	36,509	40,788
Chicago, St. Paul, Minneapolis & Omaha	12,722	19,941	9	16,243	16,252
Great Northern	21,936	40,039	9,052	19,204	28,256
International Great Northern	15,257	7,518	113	4,928	5,041
Kansas City Southern	16,099	13,949	217	8,567	8,784
Louisiana & Arkansas	235	21,414	[3] 17,217	[3] 115	[3] 17,332
Louisiana Railway & Navigation Co	14,705	2,918	(3)	(3)	(3)
Missouri Pacific	43,339	50,886	10,976	35,816	46,792
Northern Pacific	13,854	28,043	3,998	30,660	34,658
St. Louis-San Francisco	17,532	15,453	2,139	12,516	14,655
Southern Pacific	87,178	97,387	78,659	7,768	86,427
Texarkana & Fort Smith	24,734	25,658	22,016	183	22,199
Texas & New Orleans	29,308	21,878	1,115	19,066	20,181
Other railroads	139,153	130,448	19,123	105,518	124,641
Total Western district	732,941	780,175	266,912	409,161	676,073
Total United States	2,987,075	3,284,364	1,121,093	1,838,572	2,959,665

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[1] Freight Commodity Statistics, Interstate Commerce Commission. The material terminated is designated as "asphalt (natural, by-product, or petroleum)."

[2] Figures for the New York Central system include in 1930 asphalt terminated by the Cleveland, Cincinnati, Chicago & St. Louis ("Big Four"), Cincinnati Northern, and Michigan Central, which formerly were operated as separate systems.

[3] Figures for the Louisiana & Arkansas system include in 1930 asphalt terminated by the Louisiana Railway & Navigation Co., which formerly was operated as a separate system.

Two-thirds of the asphalt shipped by rail in 1930 was billed during the six months from April 1 to September 30. Shipments of asphalt originating on Class I railroads in the United States in the first quarter of the year amounted to 428,339 short tons in 1930, 463,686 tons in 1929, and 395,916 tons in 1928. In the second quarter shipments amounted to 909,760 tons in 1930, 902,945 tons in 1929, and 820,911 tons in 1928. Original shipments were largest in the third quarter, amounting to 1,046,143 tons in 1930, 1,129,208 tons in 1929, and 971,384 tons in 1928. In the last quarter, however, they amounted to only 553,707 tons in 1930, compared with 700,553 tons in 1929, and 632,320 tons in 1928.

Similarly, two-thirds of the asphalt shipped by rail in 1930 was terminated between April 1 and September 30. Class I railroads in the United States terminated in the first quarter of the year 412,725 short tons in 1930, 485,125 tons in 1929, and 433,108 tons in 1928. During the second quarter they terminated 902,651 tons in 1930, 952,809 tons in 1929, and 879,106 tons in 1928. The tonnage terminated in the third quarter amounted to 1,067,321 tons in 1930, 1,167,624 tons in 1929, and 1,012,152 tons in 1928. They terminated only 576,968 tons in the last quarter of 1930, compared with 678,806 tons in 1929 and 661,111 tons in 1928.

Shipments of asphalt over Class I railroads showed, in general, the same seasonal trend in 1930 as in previous years. In 1930, however, a somewhat larger proportion of the annual total than usual was shipped in the second quarter and a correspondingly smaller fraction in the fourth quarter. For example, 14.6 per cent of the tonnage of asphalt originating on Class I railroads was shipped in the first quarter in 1930, 14.5 per cent in 1929, and 14 per cent in 1928. Thirty-one per cent of the total asphalt shipped was billed in the second quarter in 1930, 28.3 per cent in 1929, and 29.1 per cent in 1928. In the third quarter the tonnage of asphalt shipped constituted 35.6 per cent of the total in 1930, 35.3 per cent in 1929, and 34.5 per cent in 1928. Only 18.8 per cent of the asphalt shipments originated in the fourth quarter in 1930, whereas 21.9 per cent of the annual total in 1929 and 22.4 per cent in 1928 were billed during the fourth quarter.

DOMESTIC DEMAND

The indicated domestic demand for petroleum and lake asphalt, calculated by adding imports to domestic production and subtracting exports, plus or minus stock changes, amounted to 2,965,726 short tons in 1930, a decrease of 15.9 per cent from the 3,524,895 tons apparently consumed in 1929 and of 7.3 per cent from the 3,197,735 tons apparently consumed in 1928.

About 63 per cent of the yearly demand for petroleum and lake asphalt in the United States occurs in the six months from May 1 to October 31. The following statistics of indicated demand by months in the United States are based partly on adjusted figures of monthly production and stocks. Nevertheless, they are believed to indicate with reasonable accuracy the monthly trend in the domestic demand for petroleum and lake asphalt.

Indicated demand for petroleum and lake asphalt in the United States, 1927–1930, by months, in short tons

Month	1927	1928	1929	1930
January	183,922	162,318	204,697	197,844
February	157,034	162,297	195,496	143,206
March	227,521	198,393	189,350	181,585
April	296,460	245,955	281,100	245,412
May	315,051	338,811	345,290	294,189
June	366,601	302,921	324,632	319,363
July	360,658	383,283	405,642	319,353
August	381,269	345,251	385,754	326,865
September	376,384	339,111	400,894	335,904
October	349,864	331,569	376,520	294,566
November	296,366	229,403	242,184	171,178
December	244,951	158,423	173,336	136,261
	3,556,081	3,197,735	[1] 3,524,895	2,965,726

[1] Revised figures.

CONSUMPTION BY DISTRICTS

Little change occurred from 1929 to 1930 in the regional consumption of asphalt. Of the total tonnage of asphalt (petroleum, lake, and native rock) terminated by rail in the United States 58.8 per cent in 1929 and 56.8 per cent in 1930 were delivered in the Northeastern district, lying north of the Potomac and Ohio Rivers and east of the Mississippi and Illinois Rivers. In the Southeastern district, lying south of the Potomac and Ohio Rivers and east of the Mississippi and Pearl Rivers, 12.8 per cent of the total was terminated in 1929 and 13.5 per cent in 1930. The Southwestern district, occupying the area west of the Mississippi and Pearl Rivers and south of St. Louis, Kansas City, Amarillo, and El Paso, received 13.8 per cent of the tonnage terminated in the United States in 1929 and 13.9 per cent in 1930. Only 5.3 per cent of the total was delivered to destinations in the North Central district in 1929 and only 5.4 per cent in 1930. The Pacific-Rocky Mountain district, west of Great Falls, Cheyenne, Denver, Albuquerque, and El Paso, received 9.3 per cent of the entire tonnage distributed by land carriers in the United States in 1929 and 10.4 per cent in 1930.

Asphalt (petroleum, lake, and natural rock), exclusive of road oil, distributed by rail within districts in the United States, 1927–1930, in short tons

District	1927	1928	1929	1930
Northeastern	2,024,181	1,917,546	2,329,758	1,937,230
Southeastern	536,347	444,867	509,610	459,444
Southwestern	724,527	480,789	545,361	475,658
North Central	258,260	264,014	209,491	183,530
Pacific-Rocky Mountain [1]	382,436	408,620	367,434	356,080
	3,925,751	3,515,836	3,961,654	3,411,942

[1] Includes shipments by electric railroads, minor steam railroads, and motor trucks, as well as intraport shipments.

NORTHEASTERN DISTRICT

Of the total available asphalt supply of the Northeastern district 81 per cent in 1929 and 80 per cent in 1930 were furnished by refineries operating within the district itself. The largest of these refineries were situated near New York, Philadelphia, Baltimore, Chicago, and East St. Louis. The tonnage manufactured by these refineries was 20.4 per cent less in 1930 than in 1929. The largest single outside source of supply for the Northeastern district in 1930 consisted of rock asphalt, chiefly from Kentucky, shipped across the Ohio River into Illinois, Indiana, and Ohio. These shipments are estimated at 180,000 short tons, or 6.2 per cent of the total available supply, in 1929 and 181,000 tons, or 7.7 per cent of the total supply, in 1930. Shipments of petroleum asphalt from Gulf coast refineries of Louisiana and Texas, carried by rail up the Mississippi Valley through the Southeastern district, decreased from 170,000 tons, or 5.9 per cent of the total available supply, in 1929 to 120,000 tons, or 5.1 per cent of the total supply, in 1930. Minor amounts were received by rail from the Southwestern and Pacific-Rocky Mountain districts. Imports, consisting chiefly of lake asphalt from Trinidad and Venezuela and grahamite from Cuba, into the Northeastern district decreased 58.4 per cent in tonnage in 1930; they formed 2.8 per cent of the total available supply in 1929 and only 1.4 per cent in 1930.

Source and distribution of asphalt (petroleum, lake, and natural rock), exclusive of road oil, Northeastern district, 1927–1930, in short tons

	1927	1928	1929	1930
SOURCE				
Produced within district	2,113,933	2,013,355	2,350,837	1,871,439
Received by rail from:				
Southeastern district	442,815	470,075	350,174	301,216
Southwestern district	40,610	44,501	45,000	40,000
Pacific-Rocky Mountain district	2,500	2,928	26,300	38,000
Received by water (coastwise)	24,944	41,287	52,078	51,500
Withdrawn from stocks				132
Imported	123,869	94,699	80,972	33,719
	2,748,671	2,666,845	2,905,361	2,336,006
DISTRIBUTION				
Shipped by rail:				
Within district	2,024,181	1,917,546	2,329,758	1,937,230
To North Central district	126,339	131,384	136,234	119,000
To Southeastern district	75,387	65,034	60,000	59,932
To Southwestern district	3,000	3,754	4,000	3,500
Shipped by water (coastwise and river)	307,244	302,300	194,486	107,100
Added to stocks	5,080	26,820	23,751	
Exported	207,440	220,007	157,132	109,244
	2,748,671	2,666,845	2,905,361	2,336,006

Of the total available asphalt supply of the Northeastern district 80 per cent in 1929 and 83 per cent in 1930 were terminated by railroads within the district itself. The total consumption of asphalt in the Northeastern district, as indicated by these figures, was 16.8 per cent less in 1930 than in 1929. Shipments by rail to the North Central district decreased 12.7 per cent in tonnage from 1929 to 1930, constituting 4.7 per cent of the total supply available for distribution in 1929 and 5.1 per cent in 1930. Shipments of asphalt by water decreased 44.9 per cent in tonnage from 1929 to 1930. Exports of asphalt from the Northeastern district decreased 30.5 per cent in quantity from 1929 to 1930 and declined in relative importance from 5.4 per cent of the total in 1929 to 4.7 per cent in 1930. Ninety per cent of these exports in 1929 and 95.5 per cent in 1930 consisted of petroleum asphalt.

SOUTHEASTERN DISTRICT

Of the total asphalt (petroleum, lake, and natural rock) available for consumption in the Southeastern district 52 per cent in 1929 and 57.9 per cent in 1930 were furnished by sources within the district. Of the total supply 13.9 per cent in 1929 and 19.4 per cent in 1930 were furnished by refineries located chiefly near Norfolk, Va.; Charleston, S. C.; Savannah and Brunswick, Ga.; and Parkersburg, W. Va. The output of these plants was 2.6 per cent less in 1930 than in 1929. Of the total supply of the Southeastern district, 38 per cent in 1929 and 38.5 per cent in 1930 consisted of rock asphalt quarried in Kentucky and Alabama. Receipts of asphalt by rail from the Southwestern district, largely in transit to Illinois, Indiana, and Ohio, were 23.4 per cent less in 1930 than in 1929; they constituted 35.9 per cent of the total supply in 1929 and 31.5 per cent in 1930. Imports, chiefly from Trinidad, Venezuela, and Cuba, decreased 56 per cent from 1929 to 1930; they formed only 3.7 per cent of the total supply in 1929 and 1.8 per cent in 1930.

Source and distribution of asphalt (petroleum, lake, and natural rock), exclusive of road oil, Southeastern district, 1927–1930, in short tons

	1927	1928	1929	1930
SOURCE				
Produced within district	518,011	467,246	509,612	496,367
Received by rail from:				
Northeastern district	75,387	65,034	60,000	59,932
Southwestern district	400,191	411,978	352,000	269,661
Received by water (coastwise)	21,427	12,221	21,885	14,476
Withdrawn from stocks	------	1,920	------	802
Imported	33,061	24,875	35,930	15,797
	1,048,077	983,274	979,427	857,035
DISTRIBUTION				
Shipped by rail:				
Within district	536,347	444,867	509,610	459,444
To Northeastern district	442,815	470,075	350,174	301,216
To Southwestern district	40,000	41,092	42,195	35,000
To North Central district	25,000	26,889	27,100	25,839
Shipped by water (coastwise and river)	------	------	27,708	2,061
Added to stocks	2,820	------	2,603	------
Exported	1,095	351	20,037	33,475
	1,048,077	983,274	979,427	857,035

Production and consumption of asphalt in the Southeastern district closely approach a balance. Of the total supply of asphalt (petroleum, lake, and natural rock) 52 per cent in 1929 and 53.6 per cent in 1930 were distributed by rail within the district. About 374,000 short tons in 1929 and 311,000 tons in 1930 consisted of petroleum asphalt; 135,600 tons in 1929 and 148,000 tons in 1930 consisted of rock asphalt mined in Kentucky and Alabama. About 180,000 tons of rock asphalt, or 18.4 per cent of the total supply of the Southeastern district, in 1929 and 181,000 tons, or 21.1 per cent of the total supply, in 1930 were shipped across the Ohio River into the Northeastern district. At the same time, 170,000 tons, or 17.4 per cent of the total supply, in 1929 and 120,000 tons, or 14 per cent of the total supply, in 1930 (consisting for the most part of rail receipts from Gulf coast refineries of Louisiana and Texas) were shipped by rail into the Northeastern district. Exports, chiefly petroleum asphalt, amounted to only 2 per cent of the total supply in 1929 and 3.9 per cent in 1930.

SOUTHWESTERN DISTRICT

Of the total available supply of asphalt (petroleum, lake, and natural rock) in the Southwestern district 93 per cent in 1929 and 92 per cent in 1930 were produced within the district. Of the domestic production, 67.5 per cent in 1929 and 67.4 per cent in 1930 consisted of petroleum asphalt made in refineries located near New Orleans and Baton Rouge, La.; Port Arthur, Tex.; El Dorado, Ark.; and Kansas City, Mo. The remainder consisted of bituminous limestone quarried in Uvalde and Kinney Counties, Tex., and bituminous sandstone and limestone quarried in Murray County, Okla. Only minor amounts were received by rail from other districts of the United States. Imports constituted an insignificant fraction of the total supply.

Source and distribution of asphalt (petroleum, lake, and natural rock), exclusive of road oil, Southwestern district, 1927–1930, in short tons

	1927	1928	1929	1930
SOURCE				
Produced within district	1,418,382	1,178,997	1,110,826	972,708
Received by rail from:				
Pacific-Rocky Mountain district	15,000	16,716	35,306	45,000
Northeastern district	3,000	3,754	4,000	3,500
Southeastern district	40,000	41,092	42,195	35,000
Received by water (coastwise)	4,966	1,063	1,218	457
Withdrawn from stocks		1,500		1,400
Imported	1,157		3,858	3,246
	1,482,505	1,243,122	1,197,403	1,061,311
DISTRIBUTION				
Shipped by rail:				
Within district	724,527	480,789	545,361	475,658
To Southeastern district	400,191	411,978	352,000	269,661
To Northeastern district	40,610	44,501	45,000	40,000
To North Central district	60,000	55,893	34,209	35,800
To Pacific-Rocky Mountain district	450	490		
Shipped by water (coastwise)	135,819	121,200	101,346	120,694
Added to stocks	8,700		246	
Exported	112,208	128,271	119,241	119,498
	1,482,505	1,243,122	1,197,403	1,061,311

Of the total asphalt supply available for distribution in the Southwestern district 45.5 per cent in 1929 and 44.8 per cent in 1930 were distributed by rail within the district. Rail shipments to the Southeastern district and to the Northeastern district by way of the Southeastern district decreased 23.4 per cent from 1929 to 1930; they constituted 29.4 per cent of the total in 1929 and 25.4 per cent in 1930. Shipments by water from Gulf coast ports increased 19.1 per cent from 1929 to 1930; they formed 8.5 per cent of the total supply in 1929 and 11.4 per cent in 1930. Exports changed little in quantity during the two years; they constituted 10 per cent of the total asphalt supply in 1929 and 11.3 per cent in 1930.

NORTH CENTRAL DISTRICT

Nearly two-thirds of the asphalt available for distribution in the North Central district was received by rail from the Northeastern district. Shipments from refineries, chiefly in Illinois and Indiana, constituted 64.4 per cent of the total available supply in the North Central district in 1929 and 63.8 per cent in 1930. Receipts from Gulf coast refineries by way of the Southeastern district constituted 12.8 per cent of the total in 1929 and 13.8 per cent in 1930. Direct rail shipments from the Southwestern district made up 16.2 per cent of the total in 1929 and 19.2 per cent in 1930. The remainder came from the Pacific-Rocky Mountain district.

Practically all the asphalt shipped into the North Central district is consumed within the district. Only an insignificant quantity is shipped by rail to Canada.

Source and distribution of asphalt (petroleum, lake, and natural rock), exclusive of road oil, North Central district, 1927–1930, in short tons

	1927	1928	1929	1930
SOURCE				
Received by rail from:				
Northeastern district	126,339	131,384	136,234	119,000
Southeastern district	25,000	26,889	27,100	25,839
Southwestern district	60,000	55,893	34,209	35,800
Pacific-Rocky Mountain district	50,000	51,415	14,009	6,000
	261,339	265,581	211,552	186,639
DISTRIBUTION				
Shipped by rail within district	258,260	264,014	209,491	183,530
Exported	3,079	1,567	2,061	3,109
	261,339	265,581	211,552	186,639

PACIFIC-ROCKY MOUNTAIN DISTRICT

Of the total available supply of asphalt (petroleum, lake, and native) available for distribution in the Pacific-Rocky Mountain district 94.5 per cent in 1929 and 95.8 per cent in 1930 were supplied from sources within the district. Nine-tenths of the bituminous substances produced within the district consisted of petroleum asphalt produced in refineries near San Francisco, Los Angeles, and Casper, Wyo.; the remaining one-tenth consisted of gilsonite, wurtzilite, and ozokerite mined in northeastern Utah and bituminous sandstone mined in Santa Cruz and Santa Barbara Counties, Calif., and Carbon County, Utah. Imports of asphalt from foreign countries were insignificant.

Source and distribution of asphalt (petroleum, lake, and native), exclusive of road oil, Pacific-Rocky Mountain district, 1927–1930, in short tons

	1927	1928	1929	1930
SOURCE				
Produced within district	606, 174	688, 868	737, 507	692, 629
Received by rail from Southwestern district	450	490	----------	----------
Received by water (coastwise)	13, 237	13, 000	32, 076	30, 000
Withdrawn from stocks	----------	8, 800	10, 487	----------
Imported	10	13	259	317
	619, 871	711, 171	780, 329	722, 946
DISTRIBUTION				
Shipped by rail:				
Within district	242, 579	232, 332	206, 136	168, 012
To North Central district	50, 000	51, 415	14, 009	6, 000
To Southwestern district	15, 000	16, 716	35, 306	45, 000
To Northeastern district	2, 500	2, 928	26, 300	38, 000
Shipped by water (coastwise)	58, 258	63, 063	109, 385	100, 000
Shipped by electric railroads, minor steam railroads, and motor trucks, and intraport	139, 857	176, 288	161, 298	188, 068
Added to stocks	10, 600	----------	----------	9, 650
Exported	101, 077	168, 429	227, 895	168, 216
	619, 871	711, 171	780, 329	722, 946

Of the total available supply of asphalt in the Pacific-Rocky Mountain district 47 per cent in 1929 and 49 per cent in 1930 were distributed within the district by steam railroad, electric railway, or motor truck, or by water in and around the port of San Francisco. In addition, 14 per cent of the total in 1929 and 13.8 per cent in 1930 were shipped coastwise, chiefly to destinations along the Pacific coast. Because of the long rail haul, comparatively little asphalt was shipped by rail to other parts of the United States. Exports, largely to far eastern countries, decreased 26.2 per cent in quantity and declined in relative importance from 29.2 per cent of the total in 1929 to 23.3 per cent in 1930.

IMPORTS AND EXPORTS

IMPORTS

Imports of natural asphalt into the United States decreased 56 per cent in quantity (from 121,019 short tons in 1929 to 53,197 tons in 1930) and 52.2 per cent in value (from $955,606 in 1929 to $457,172 in 1930). As these high-grade natural asphalts are refined and sold chiefly by petroleum refiners and are employed in connection with or come into direct competition with petroleum asphalts in many of their uses they are discussed in the present chapter in connection with petroleum asphalts rather than with natural rock asphalts, which contain a comparatively low percentage of bitumen and are used almost entirely for paving roads and streets.

Three countries furnished almost the entire imports in both 1929 and 1930. Imports from the Pitch Lake near Brighton, Trinidad, amounted to 69,909 short tons in 1929 but decreased to 38,783 tons in 1930; their relative importance increased, however, from 57.8 per cent of the total imports in 1929 to 72.9 per cent in 1930. Imports from Bermudez Lake near Guanoco, in eastern Venezuela, amounted to 36,605 short tons, or 30.2 per cent of the total imports, in 1929; no asphalt was imported from this source in 1930. Mines in the Province of Camaguey, Cuba, shipped 12,854 short tons of grahamite to the United States in 1929 and 13,508 tons in 1930; these imports constituted 10.6 per cent of the total in 1929 and 25.4 per cent in 1930.

Native asphalt and bituminous rock imported into the United States, 1926–1930, by countries

[General imports]

Country	1926		1927		1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
North America:										
Canada	167	$2,211	19	$673	614	$11,261	374	$6,921	75	$1,519
Mexico	1,668	24,390			52	1,105			3	33
West Indies:										
British—										
Barbados	190	7,861	21	2,292	22	2,752	44	4,340	7	793
Trinidad and Tobago	76,562	562,888	85,038	626,566	51,599	364,656	69,909	558,914	38,783	293,865
Other			2,319	17,419						
Cuba	11,886	94,087	2,616	27,714	12,629	109,448	12,854	113,438	13,508	148,095
Dominican Republic									116	1,010
South America:										
Argentina	12	86	53	1,111						
Ecuador	4,637	30,636								
Venezuela	46,292	305,854	66,254	437,744	53,046	350,478	36,605	253,544		
Europe:										
Azores and Madeira Islands			(1)	5						
Belgium			7	63	1	80	3	139		
Czechoslovakia			1	25						
Denmark	49	800	3	126	2	78	1	44		
France	3	78	2	140	9	388	23	988		
Germany	1,126	15,167	1,619	20,613	1,467	16,481	1,136	12,814	566	4,439
Italy					1	26	8	95		
Netherlands	(1)	10	2	310	13	638	2	427	(1)	10
Poland and Danzig			4	100	2	25				
Switzerland	2	483	58	495	2	499	1	246	1	250
United Kingdom	10	545	81	5,029	17	1,481	35	2,315	28	1,278
Yugoslavia and Albania	28	500								
Africa: Egypt					112	5,650	24	1,381	110	5,880
	142,632	1,045,596	158,097	1,140,425	119,588	865,046	121,019	955,606	53,197	457,172

Figures for quantity not available.

EXPORTS

Exports of petroleum asphalt decreased 14.4 per cent in quantity (from 479,404 short tons in 1929 to 410,389 tons in 1930) and 14.8 per cent in value (from $8,542,975 in 1929 to $7,277,032 in 1930).

The principal decreases in tonnage occurred in shipments to northern and western Europe. Exports of petroleum asphalt to Germany, which amounted to 103,550 short tons in 1928 and 42,547 tons in 1929, dropped to 10,324 tons in 1930. Similarly, exports to the Netherlands fell from 55,540 short tons in 1928 and 18,845 tons in 1929 to 7,305 tons in 1930. Exports of asphalt to the United Kingdom declined from 35,736 short tons in 1928 and 33,781 tons in 1929 to 27,391 tons in 1930.

On the other hand, exports of petroleum asphalt to France, which amounted to only 30,439 short tons in 1928 and 35,661 tons in 1929, increased to 45,426 tons in 1930. Similarly, exports to Belgium grew from 5,078 short tons in 1928 and 5,944 tons in 1929 to 6,733 tons in 1930. Exports to Denmark, which fell from 16,744 short tons in 1928 to 6,647 tons in 1929, rose to 9,709 tons in 1930.

Exports of petroleum asphalt to Australia, which rose from 33,391 short tons in 1928 to 55,028 tons in 1929, dropped to 40,165 tons in 1930. Similarly, exports to the Netherland East Indies, which increased from 23,543 short tons in 1928 to 31,892 tons in 1929, declined to 24,230 tons in 1930. Japan, which imported 16,300 short tons of petroleum asphalt from the United States in 1928 and 17,196 tons in 1929, took only 13,887 tons of American asphalt in 1930. China's receipts of petroleum asphalt from the United States amounted to 12,143 short tons in 1928 and 12,280 tons in 1929 but fell to 7,820 tons in 1930. In contrast to the general decline in asphalt shipments to eastern Asia, exports of petroleum asphalt from the United States to the Philippine Islands grew from 4,730 short tons in 1928 and 8,030 tons in 1929 to 10,097 tons in 1930. Similarly, exports of petroleum asphalt to British Malaya increased from 4,719 short tons in 1928 and 9,128 tons in 1929 to 12,870 tons in 1930. Exports to Hong Kong grew from 3,508 short tons in 1928 and 4,189 tons in 1929 to 4,630 tons in 1930.

The increase in asphalt shipments to the Mediterranean area was due chiefly to greater purchases by Italy, which took 11,686 short tons in 1928, 15,305 tons in 1929, and 25,696 tons in 1930.

In the Western Hemisphere, exports of petroleum asphalt to Canada dropped from 47,799 short tons in 1928 and 47,719 tons in 1929 to 42,064 tons in 1930. Exports to Argentina, which amounted to 3,975 short tons in 1928 and 5,365 tons in 1929, fell to 2,746 tons in 1930. Exports to Brazil dropped from 11,002 short tons in 1928 and 11,291 tons in 1929 to 4,281 tons in 1930. On the other hand, Cuba, which took only 105 short tons in 1928, imported 19,609 tons of asphalt from the United States in 1929 and 32,496 tons in 1930.

Petroleum asphalt exported from the United States, 1928–1930, by countries

Country	1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value
Canada	47,799	$728,539	47,719	$634,544	42,064	$558,434
Cuba	105	3,660	19,609	419,989	32,496	715,265
Argentina	3,975	86,686	5,365	112,996	2,746	57,003
Brazil	11,002	184,966	11,291	226,198	4,281	77,188
Chile	1,082	20,792	2,496	44,701	2,150	42,191
Peru	1,314	20,501	782	13,681	1,079	18,728
Belgium	5,078	92,484	5,944	101,223	6,733	120,585
Denmark	16,744	392,262	6,647	142,799	9,709	158,600
France	30,439	636,014	35,661	651,977	45,426	779,150
Germany	103,550	2,300,033	42,547	787,861	10,324	201,825
Italy	11,686	246,382	15,305	279,086	25,696	522,733
Netherlands	55,540	1,202,011	18,845	340,218	7,305	135,335
Spain	14,066	307,659	29,156	469,725	18,218	330,349
United Kingdom	35,736	816,351	33,781	783,829	27,391	629,207
British India	9,965	202,854	9,233	178,560	9,491	190,841
British Malaya	4,719	89,585	9,128	139,381	12,870	190,794
Ceylon	6,003	107,940	7,766	140,094	8,717	119,841
China	12,143	213,928	12,280	229,187	7,820	135,454
French Indo-China	5,997	99,518	7,805	119,347	5,310	75,810
Hong Kong	3,508	65,573	4,189	67,209	4,630	84,247
Japan	16,300	298,953	17,196	367,758	13,887	269,052
Netherland East Indies	23,543	385,140	31,892	494,717	24,230	348,527
Philippine Islands	4,730	79,607	8,030	118,317	10,097	144,903
Algeria and Tunisia	2,770	57,309	2,908	48,875	5,249	79,190
Union of South Africa	8,251	128,035	3,815	94,475	8,608	196,777
Australia	33,391	536,519	55,028	842,870	40,165	669,681
New Zealand	10,121	202,193	9,317	160,111	7,362	102,764
Other countries	12,805	283,007	25,669	533,247	16,335	322,558
	492,362	9,788,501	479,404	8,542,975	410,389	7,277,032

ROAD OIL

Road oil is a residual oil from the distillation of petroleum, applied directly to the surface of a road, highway, or street to lay the dust and bind the loose particles of rock together. Untreated crude oil, especially of the heavy asphaltic type, has also been used as a surface dressing for roads.

The production of road oil by petroleum refineries in the United States amounted to 797,099 short tons (4,750,000 barrels) in 1929 and 912,071 tons (5,435,000 barrels) in 1930, an increase of 14.4 per cent. Refineries of the Indiana-Illinois district, which manufactured 211,750 tons, or 26.6 per cent of the national production, in 1929, made 292,068 tons, or 32 per cent of the total, in 1930. On the other hand, the output of the California refineries decreased from 313,490 tons, or 39.3 per cent of the national total, in 1929 to 290,150 tons, or 31.8 per cent of the total, in 1930. Refineries of the East coast district furnished 113,768 tons, or 14.3 per cent of the total, in 1929 and 119,857 tons, or 13.1 per cent, in 1930. Gulf coast refineries in Texas and Louisiana produced 77,974 tons, or 9.8 per cent of the total, in 1929 and 100,144 tons, or 11 per cent, in 1930.

Road oil produced at petroleum refineries in the United States, 1928–1930, by districts, in short tons

District	1928	1929	1930
East coast	103,391	113,768	119,857
Appalachian	1,343	773	14,342
Indiana-Illinois	200,163	211,750	292,068
Oklahoma-Kansas-Missouri	32,243	49,152	61,452
Texas:			
Gulf coast		63,255	77,891
Rest of State	514	11	26
Total Texas	514	63,266	77,917
Louisiana-Arkansas:			
Louisiana Gulf coast	49,882	14,719	22,253
Northern Louisiana and Arkansas			4,000
Total Louisiana and Arkansas	49,882	14,719	26,253
Rocky Mountain	6,932	30,181	30,032
California	223,274	313,490	290,150
Grand total	617,742	797,099	912,071

More road oil was made from foreign crude in 1930 than in 1929. The amount distilled from foreign crude increased from 116,126 short tons in 1929 to 152,248 tons in 1930, or from 14.6 per cent of the national total in 1929 to 16.7 per cent in 1930. Of the road oil made from foreign crude 75.4 per cent (87,563 tons) was made in East coast refineries in 1929 and 78.7 per cent (119,829 tons) in 1930.

Production, stocks, and sales of road oil at petroleum refineries in the United States in 1930, by districts

District	Production (short tons)	Stocks (short tons)		Sales	
		Dec. 31, 1929 [1]	Dec. 31, 1930	Short tons	Value
East coast	119,857	3,663	2,672	120,848	$1,359,714
Appalachian	14,342	560	---------	14,902	149,522
Indiana-Illinois	292,068	18,835	7,132	303,771	1,909,530
Oklahoma-Kansas-Missouri	61,452	980	653	61,779	351,693
Texas:					
Gulf coast	77,891	---------	---------	77,891	1,089,464
Rest of State	26	---------	---------	26	102
Total Texas	77,917	---------	---------	77,917	1,089,566
Louisiana-Arkansas:					
Louisiana Gulf coast	22,253	---------	---------	22,253	218,636
Northern Louisiana and Arkansas	4,000	---------	---------	4,000	48,000
Total Louisiana and Arkansas	26,253	---------	---------	26,253	266,636
Rocky Mountain	30,032	2,012	4,250	27,794	212,296
California	290,150	26,693	12,553	304,290	2,071,832
Grand total	912,071	52,743	27,260	937,554	7,410,789

[1] Revised figures.

Stocks of road oil, which were reported as 24,642 short tons on December 31, 1929, were increased by the transfer of 28,101 tons from fuel oil and other stocks. This transfer illustrates the difficulty of keeping adequate records of road-oil stocks. Certain heavy asphaltic residual oils may equally well be burned as fuel oil or spread on the highway as road oil. Accordingly, the designation under which these oils are reported depends on the use to which the purchaser intends to put them. Many companies report only sales of road oil and keep no records of road oil as such. At the end of 1930 stocks of road oils reported by the refining companies in the United States totaled 27,260 tons.

Sales of road oil in the United States amounted to 799,829 short tons in 1929 and 937,554 tons in 1930, an increase of 17.2 per cent. The principal increase occurred in the Indiana-Illinois district, where 219,343 tons were sold in 1929 and 303,771 tons in 1930. On the other hand, sales of road oil by California refineries decreased from 307,080 tons in 1929 to 304,290 tons in 1930. In the East coast district sales of road oil increased from 114,769 tons in 1929 to 120,848 tons in 1930 and in the Gulf coast district, from 77,983 tons in 1929 to 100,144 tons in 1930.

Sales of road oil increased 1.5 per cent in value (from $7,304,221 in 1929 to $7,410,789 in 1930). The average sales value for the United States decreased from $9.13 per short ton (about $1.53 per barrel) in 1929 to $7.90 per ton ($1.33 per barrel) in 1930. In the East coast district the average sales value decreased from $15.09 per ton ($2.54 per barrel) in 1929 to $11.25 per ton ($1.89 per barrel) in 1930. In the Indiana-Illinois district the average sales value decreased from $6.78 per ton ($1.14 per barrel) in 1929 to $6.29 per ton ($1.05 per barrel) in 1930; in the Gulf coast district, from $13.91 per ton ($2.34 per barrel) in 1929 to $13.06 per ton ($2.19 per barrel) in 1930; and in California, from $7.93 per ton ($1.33 per barrel) in 1929 to $6.81 per ton ($1.14 per barrel) in 1930.

PRODUCERS OF PETROLEUM ASPHALT AND ROAD OIL

The following operators reported the production of asphaltic material from crude petroleum in the United States in 1930:

Aetna Oil Service, 1202 South Third Street, Louisville, Ky.
Associated Oil Co., 79 New Montgomery Street, San Francisco, Calif.
Atlantic Refining Co., 260 South Broad Street, Philadelphia, Pa.
Barber Asphalt Co., 1600 Arch Street, Philadelphia, Pa.
James B. Berry & Sons Co., 310 South Michigan Avenue, Chicago, Ill.
Colonial Beacon Oil Co., 30 Beacham Street, Everett, Mass.
Gilmore Oil Co., 2423 East Twenty-eighth Street, Los Angeles, Calif.
Globe Oil & Refining Co., Blackwell, Okla.
Houston Oil Terminal Co., Post-Dispatch Building, Houston, Tex.
Humble Oil & Refining Co., Houston, Tex.
Indian Refining Co., Lawrenceville, Ill.
Latonia Refining Corporation, Midland Building, Cleveland, Ohio.
Lincoln Oil Refining Co., Robinson, Ill.
Lion Oil Refining Co., Seventh Floor, Exchange Building, El Dorado, Ark.
Louisiana Oil & Refining Corporation, Shreveport, La.
Macmillan Petroleum Corporation, 530 West Sixth Street, Los Angeles, Calif.
Magnolia Petroleum Co., Post Office Box 900, Dallas, Tex.
Mexican Petroleum Corporation of Louisiana (Inc.), 122 East Forty-second Street, New York, N. Y.
Mexican Petroleum Corporation of Maine (Inc.), 122 East Forty-second Street, New York, N. Y.
Midwest Refining Co., Post Office Box 240, Denver, Colo.
Orange County Refining Co., 317½ East Second Street, Los Angeles, Calif.
Paraffine Cos. (Inc.), 475 Brannan Street, San Francisco, Calif.
Pioneer Paper Co., 120 Arcade Station, Los Angeles, Calif.
Richfield Oil Co. of California, 550 South Flower Street, Los Angeles, Calif.
Seaside Oil Co., Summerland, Calif.
Shell Oil Co., Shell Building, San Francisco, Calif.
Shell Petroleum Corporation, Shell Building, St. Louis, Mo.
Sinclair Refining Co. of Louisiana (Inc.), 45 Nassau Street, New York, N. Y.
Solar Refining Co., Post Office Box 581, Lima, Ohio.
Standard Oil Co. of California, 225 Bush Street, San Francisco, Calif.
Standard Oil Co. (Indiana), 910 South Michigan Avenue, Chicago, Ill.
Standard Oil Co. of Kansas, Neodesha, Kans.
Standard Oil Co. of Louisiana, Baton Rouge, La.
Standard Oil Co. of New Jersey, 26 Broadway, New York, N. Y.
Standard Oil Co. of New York, 26 Broadway, New York, N. Y.
Standard Oil Co. of Ohio, East Ohio Gas Building, Cleveland, Ohio.
Sun Oil Co., 1428 South Penn Square, Philadelphia, Pa.
The Texas Co., Houston, Tex.
Union Oil Co. of California, Union Oil Building, Los Angeles, Calif.
Warner-Quinlan Co., 2 Park Avenue, New York, N. Y.
White Eagle Oil Corporation, Casper, Wyo.
Yale Oil Corporation of South Dakota, Post Office Box 1035, Billings, Mont.

MANUFACTURES OF ASPHALT

ROOFING

From 35 to 37 per cent of all asphalt (exclusive of road oil) sold in the United States is consumed by the roofing industry, either as roofing asphalt or as roofing flux. Prepared roofing is made by saturating paper felt with hot asphalt and coating it variously with talc, sand, or ground slate. It is sold both in rolls, either coated with slate particles of various colors or uncoated, and in strips or individual shingles of various sizes and shapes.

According to the Bureau of the Census, 100 factories made prepared roofing of asphalt-saturated or tar-saturated felt in 1929. They employed on an average 6,041 wage earners and paid out $8,835,730 in wages. They made 16,302,557 roofing squares[8] of smooth-roll asphalt roofing, valued at $17,875,556; 9,718,372 squares of grit-roll asphalt roofing, valued at $16,077,201; 9,692,774 squares of strip, patented, and hexagon asphalt shingles (all kinds), valued at $33,707,384; and 1,983,862 squares of individual and single-thickness asphalt shingles (all kinds), valued at $8,583,958. They also made 135,509 short tons of asphalt-saturated felt, valued at $6,119,890; 60,273 tons of tar-saturated felt, valued at $2,763,774; 35,161 tons of solid asphalt roof cements, valued at $842,420; 32,331,227 pounds of fibrous plastic roof cement, valued at $1,402,009; 4,873,160 gallons of fibrous liquid roof coating, valued at $2,086,949; 1,931,270 gallons of nonfibrous liquid roof coating, valued at $1,017,340; and other roofing materials not specified to the value of $3,764,171.

In addition, roofing materials valued at $3,244,019 were made as secondary products by establishments engaged primarily in other lines of manufacture. This total includes asphalt roll roofing, asphalt shingles, and tar and asphalt saturated felts to the value of $2,000,857 and coal-tar roofing pitch and roof coatings and cements to the value of $1,243,162.

Statistics of the asphalt and tar roofing-materials industry in the United States, 1925, 1927, and 1929[1]

	1925	1927	1929
Number of establishments	140	100	100
Wage earners (average for year)	8,310	7,255	6,041
Wages	$12,144,764	$10,712,626	$8,835,730
Horsepower employed	34,161	41,740	(2)
Cost of materials, containers, and power	$78,596,627	$67,327,735	$59,461,626
Products (value):			
Roofing materials	$104,968,296	$105 376,087	$94,240,652
Other products	18,622,515	17,834,218	8,914,512
Total	123,590,811	123,210,305	103,155,164
Value added by manufacture	44,994,184	55,882,570	43,693,538

[1] Source: Bureau of the Census.
[2] No data.

Of the 100 factories making asphalt-saturated roofing in 1929, 13 factories, employing 1,351 wage earners, were in Illinois; 10 factories, employing 679 wage earners, were in New Jersey; 10 factories, employing 173 wage earners, were in New York; 9 factories, employing 354 wage earners, were in Ohio; 8 factories, employing 352 wage earners, were in California; and 6 factories, employing 352 wage earners, were in Pennsylvania.

Monthly statistics of shipments of prepared roofing from factories in the United States are published from time to time in the Monthly Survey of Current Business issued by the Bureau of Foreign and Domestic Commerce. Reports are obtained from 41 manufacturers whose output represents a large percentage of the industry. The monthly shipments for 1928 and 1929 show that the heaviest demand for prepared roofing is in the spring and early summer. Forty-three per cent of the total shipments of the year are made in the four months from March 1 to June 30. The monthly shipments for 1930 are not taken into account in the foregoing statement, as business conditions during that year were in many respects abnormal.

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[8] A roofing square is the amount of roofing needed to cover 100 square feet of surface.

Prepared roofing shipped from factories in the United States, 1928–1930, by months and by types, in thousands of roofing squares [1]

	Roll		Shingles		
	Smooth	Grit	Strip patented and hexagon (all kinds)	Individual and single-thickness (all kinds)	Total
1928					
January	1,199	514	345	83	2,141
February	941	486	348	81	1,856
March	1,797	1,236	1,065	179	4,277
April	1,506	1,013	955	198	3,672
May	1,403	995	1,023	227	3,648
June	1,726	1,157	1,091	222	4,196
July	1,195	830	718	152	2,895
August	1,258	853	784	176	3,071
September	1,394	841	785	167	3,187
October	1,605	824	851	173	3,453
November	1,209	528	620	114	2,471
December	842	331	417	83	1,673
	16,075	9,608	9,002	1,855	36,540
1929					
January	1,325	484	515	96	2,420
February	1,799	717	745	113	3,374
March	2,084	1,039	948	167	4,238
April	2,062	1,118	1,167	235	4,582
May	1,915	1,129	1,295	244	4,583
June	1,452	988	1,107	209	3,756
July	1,338	983	801	202	3,324
August	1,077	829	813	184	2,903
September	1,231	826	781	173	3,011
October	1,502	840	795	175	3,312
November	1,161	532	510	123	2,326
December	950	513	482	94	2,039
	17,896	9,998	9,959	2,015	39,868
1930					
January	1,225	493	598	67	2,383
February	709	338	252	57	1,356
March	1,062	581	484	113	2,240
April	1,192	676	715	144	2,727
May	1,089	731	730	164	2,714
June	924	653	656	151	2,384
July	803	612	597	139	2,151
August	1,021	655	692	176	2,544
September	1,437	872	1,001	196	3,506
October	1,574	922	572	191	3,259
November	743	372	283	86	1,484
December	583	242	238	63	1,126
	12,362	7,147	6,818	1,547	27,874

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[1] Source: Survey of Current Business.

Practically all the prepared roofing manufactured in the United States is consumed within the country. Little more than 2 per cent of the total shipped from roofing factories is exported to other countries. China and Japan are the chief buyers of prepared roofing from the United States.

Asphalt roofing exported from the United States, 1928–1930, by countries

Country	1928		1929		1930	
	Squares (100 square feet)	Value	Squares (100 square feet)	Value	Squares (100 square feet)	Value
Canada	9,716	$23,967	43,340	$86,581	19,161	$38,644
Cuba	55,681	59,591	13,239	15,091	17,754	18,301
Mexico	34,019	41,716	32,271	51,689	30,170	53,852
Argentina	23,498	38,695	20,477	30,770	25,249	32,369
Brazil	12,135	15,983	11,783	14,943	6,328	8,322
United Kingdom	134,687	183,569	72,353	86,309	878	2,742
British India	22,674	42,800	33,820	57,076	33,375	52,474
British Malaya	11,700	24,767	7,720	13,444	10,593	18,434
China	123,178	111,934	146,798	122,435	111,741	78,697
Japan	173,442	216,389	156,012	186,234	72,940	87,394
Kwangtung	36,234	35,297	46,983	45,227	43,339	42,662
Union of South Africa	70,712	127,520	34,800	65,734	32,069	54,080
Australia	51,916	82,985	47,270	77,593	16,957	26,556
New Zealand	54,014	59,401	33,149	52,020	13,643	22,291
Other countries	121,302	186,815	129,051	197,046	109,229	151,544
	934,908	1,251,429	829,066	1,102,192	543,426	688,362

FELT-BASE FLOOR COVERINGS

Most of the asphalt-saturated felt made by the roofing factories is sold to subsidiary or independent establishments manufacturing asphalted felt-base floor coverings. These floor coverings consist of rag felt, similar to but of better grade than roofing felt, saturated with asphalt and coated on the face side with an ornamental design printed in colored paints and on the reverse side with paint of a single color, usually red. Other establishments purchase dry rag felt, saturate it with asphalt, and make it into floor coverings.

According to the Bureau of the Census, 13 establishments, employing 2,259 wage earners, manufactured asphalted felt-base floor coverings to the value of $28,954,487 in 1929 and other products to the value of $2,021,022. In addition, 7 establishments, engaged primarily in the manufacture of linoleum and employing 5,544 wage earners, manufactured asphalted felt-base floor coverings to the value of $7,096,612.

Of the 13 establishments engaged primarily in the manufacture of asphalted felt-base floor coverings, 7 were in New Jersey, 2 in Pennsylvania, and 1 each in California, Maine, Massachusetts, and Ohio. Of the 7 linoleum establishments, 4 were in New Jersey, 2 in Pennsylvania, and 1 in New York.

The yardage of asphalted felt-base floor coverings manufactured has increased more than three and one-half times in the nine years from 1921 to 1929. The production of such floor coverings in the United States totaled 31,728,043 square yards, valued at $13,042,539, in 1921; 71,076,078 square yards, valued at $30,239,508, in 1923; 77,888,999 square yards, valued at $30,029,431, in 1925; 111,793,136 square yards, valued at $34,900,255, in 1927; and 113,823,600 square yards, valued at $36,051,099, in 1929.

Statistics of the asphalted felt-base floor-covering industry in the United States, 1925, 1927, and 1929[1]

	1925	1927	1929
Number of establishments	11	12	13
Wage earners (average for year)	2,464	2,442	2,259
Wages	$3,337,770	$3,694,808	$3,365,838
Horsepower employed	9,575	8,904	(2)
Cost of materials, containers, and power	$14,930,491	$16,186,459	$13,813,198
Production (square yards):[3]			
Piece goods	55,456,697	59,710,679	54,529,835
Rugs	22,432,302	52,082,457	59,293,765
Total	77,888,999	111,793,136	113,823,600
Products (value):[3]			
Piece goods	$17,625,922	$14,983,205	$14,234,726
Rugs	12,403,509	19,917,050	21,816,373
Total	30,029,431	34,900,255	36,051,099

[1] Source: Bureau of the Census.
[2] No data.
[3] Includes production by establishments manufacturing primarily linoleum.

Almost all the asphalted felt-base floor coverings made in the United States are consumed within the country; only 3 to 5 per cent of the total yardage is shipped to foreign countries. Exports of domestic felt-base floor coverings have ranged in recent years from 4,000,000 to 5,000,000 square yards a year. Great Britain and the British Dominions have been the best customers for felt-base floor coverings exported from the United States. Of the total exported in 1930, the United Kingdom took 33.8 per cent; Australia, 19.2 per cent; Canada, 11.4 per cent; Union of South Africa, 7.6 per cent; and New Zealand, 4.8 per cent. Of the non-British countries, France, Belgium, Brazil, and Argentina have been the largest purchasers of felt-base floor coverings exported from the United States.

Felt-base floor coverings exported from the United States, 1928–1930, by countries

Country	1928		1929		1930	
	Square yards	Value	Square yards	Value	Square yards	Value
Canada	570,590	$173,985	581,857	$191,191	498,166	$159,139
Newfoundland	83,994	17,683	116,107	25,181	98,374	22,243
Argentina	95,870	37,937	103,634	44,087	44,738	18,161
Brazil	231,925	101,246	122,871	54,585	107,946	45,139
Colombia	82,678	32,884	56,907	19,579	32,101	11,251
Belgium	85,430	20,963	159,945	40,075	96,964	24,485
France	80,483	23,018	124,135	47,992	100,741	25,242
Irish Free State	55,721	29,766	83,645	29,273	63,062	20,025
Norway	50,814	21,726	67,847	27,801	80,434	28,555
United Kingdom	1,404,595	415,459	1,404,628	493,359	1,472,924	539,898
British Malaya	129,810	42,671	72,333	23,467	95,863	28,346
China	38,171	15,015	55,284	19,601	40,963	13,168
Union of South Africa	315,112	138,044	372,582	166,565	331,746	137,889
Australia	1,479,095	591,138	1,342,262	530,413	836,847	278,359
New Zealand	221,063	90,407	221,643	93,332	210,565	85,728
Other countries	272,587	102,909	308,658	116,571	243,125	96,227
	5,197,938	1,854,851	5,194,338	1,923,072	4,354,559	1,533,855

MISCELLANEOUS MANUFACTURES

No statistics are available to show the production of many articles made wholly or partly of asphalt, such as electrical insulation, molded articles, automobile brake linings, bituminized wall board, and paints, varnishes, or lacquers made by establishments other than petroleum refineries. Many of these minor manufactures of asphalt are made by establishments manufacturing roofing, felt-base floor coverings, or paints.

Exports of manufactures of asphalt and bitumen (other than roofing) increased from 19,522 short tons, valued at $770,822, in 1928 to 31,210 tons, valued at $1,280,068, in 1929 but fell to 26,834 tons, valued at $1,120,091,in 1930. Canada was the largest purchaser of such exports.

Manufactures of asphalt and bitumen (except roofing) exported from the United States 1928–1930, by countries

Country	1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value
Canada	3,872	$134,007	6,604	$243,421	6,710	$210,017
Cuba	507	12,782	232	8,423	170	11,731
Dominican Republic	739	17,354	12	1,937	16	830
Jamaica	1,381	69,660	792	35,152	879	35,062
Mexico	118	6,807	171	7,983	379	14,029
Panama	332	17,713	116	5,185	63	2,977
Argentina	589	23,098	671	40,096	1,216	42,875
Brazil	2,782	100,546	2,005	100,502	968	34,817
Chile	383	12,135	244	8,477	552	15,843
Colombia	117	5,004	1,271	57,816	499	22,592
Uruguay	267	8,341	634	19,936	400	11,533
Venezuela	159	7,416	1,444	82,623	1,401	70,318
Belgium	111	4,055	258	7,935	162	14,366
France	648	21,949	394	17,317	387	30,284
Germany	1,289	37,648	2,611	76,190	958	56,109
Hungary	--------	--------	--------	--------	1,130	33,271
Italy	674	21,880	1,156	26,993	210	12,211
Netherlands	71	3,306	356	8,472	1,418	113,561
Spain	421	15,845	3,423	99,313	1,062	30,134
United Kingdom	1,257	60,754	1,797	92,734	2,079	104,561
British India	209	9,329	1,579	84,882	977	49,628
Japan	534	39,517	853	61,523	1,135	46,415
Union of South Africa	266	12,711	268	17,040	406	18,624
Mozambique	345	30,117	7	1,645	225	11,909
Australia	1,190	37,391	797	37,101	365	19,508
New Zealand	331	10,026	805	20,182	310	8,284
Other countries	930	51,431	2,710	117,190	2,757	98,602
	19,522	770,822	31,210	1,280,068	26,834	1,120,091

ACKNOWLEDGMENTS

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LIME[1]

By A. T. Coons

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SUMMARY

Sales of lime in 1930 by producers in the United States amounted to 3,387,880 short tons, valued at $25,616,486, a decrease of 21 per cent in quantity and 23 per cent in value compared with 1929. Production in 1930 represented the smallest output since 1921 and reflected the country-wide industrial depression as indicated by slower activity in the building, agricultural, and chemical industries. Conditions in the lime industry were unsettled, with general decreases in price and demand. Lime for construction (1,204,614 tons, valued at $10,050,270) was affected most by the unfavorable business situation and decreased 27 per cent in quantity and 30 per cent in value from 1929; this is the fifth consecutive year in which a decrease was shown for this class of lime, and the output in 1930 was nearly 50 per cent below that in 1925. Lime for chemical use (1,840,155 tons, valued at $13,193,437) decreased 20 per cent in quantity and 21 per cent in value. Lime for agricultural use (343,111 tons, valued at $2,372,779) increased 1 per cent in quantity but decreased slightly in value. Ohio and Pennsylvania, the largest producing States, showed decreases of 23 and 19 per cent, respectively, in quantity. Of the other States producing considerable quantities of lime, California was the only one to report increased output (3 per cent).

The total number of plants that reported operations in 1930 was 375, 6 less than in 1929 and 155 less than in 1922, the most recent year when production did not exceed 4,000,000 tons. During the past nine years, a number of important factors have contributed to the abandonment or consolidation of many plants. Labor conditions and wages at the plants were about the same in 1930 as in 1929; the cost of materials was somewhat lower, and prices also were lower. The average value per ton at the plant of the total lime sold decreased from $8.18 in 1928 to $7.84 in 1929 and to $7.56 in 1930. The average value per ton for building lime ($8.34) was 38 cents less than in 1929, for chemical lime ($7.17) 16 cents less, and for agricultural lime ($6.92) 14 cents less. Except for the output of one firm in Alabama, the accompaning tables do not include lime that is not a commercial product but is burned, for use in manufacturing, from stone either quarried or purchased by the manufacturer. This stone is reported to the Bureau of Mines as raw limestone and is included in the statistics on stone; it is used mainly by alkali works, carbide works, sugar refineries, paper mills, and smelters and other metallurgical plants.

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[1] Work on manuscript completed September, 1931.

PRODUCTION

Lime sold by producers in the United States, 1921–1930

Year	Number of plants in operation	Short tons	Value [1]	
			Total	Average
1921	520	2, 532, 153	$24, 895, 370	$9. 83
1922	530	3, 639, 617	33, 255, 039	9. 14
1923	467	4, 076, 243	39, 993, 652	9. 81
1924	450	4, 072, 000	39, 596, 423	9. 72
1925	450	4, 580, 823	42, 609, 141	9. 30
1926	435	4, 560, 398	41, 566, 452	9. 11
1927	417	4, 414, 932	38, 638, 413	8. 75
1928	411	4, 458, 412	36, 449, 635	8. 18
1929	381	4, 269, 768	33, 478, 848	7. 84
1930	375	3, 387, 880	25, 616, 486	7. 56

[1] The value given represents the value of bulk lime f. o. b. at point of shipment and does not include cost of barrel or package.

Lime sold by producers in the United States, 1929 and 1930, by States

State	1929			1930		
	Number of plants in operation	Short tons	Value	Number of plants in operation	Short tons	Value
Alabama	10	209, 260	$1, 223, 623	8	164, 822	$929, 302
Arizona	4	42, 971	397, 308	5	35, 642	317, 881
Arkansas	4	33, 647	295, 816	4	30, 349	241, 938
California	9	49, 753	526, 391	9	51, 302	498, 795
Colorado	4	7, 046	76, 791	4	6, 777	73, 156
Connecticut	4	35, 180	386, 855	4	28, 489	282, 521
Florida	2	(1)	(1)	2	(1)	(1)
Georgia	1	10, 757	77, 239	1	7, 455	50, 655
Hawaii	1	6, 384	77, 389	1	7, 591	92, 043
Idaho	1	(1)	(1)	3	2, 463	25, 156
Illinois	8	119, 382	973, 312	9	89, 709	721, 143
Indiana	8	116, 795	786, 814	9	87, 965	600, 784
Iowa	1	(1)	(1)	----------	----------	----------
Kentucky	1	(1)	(1)	2	(1)	(1)
Maine	4	92, 428	772, 443	3	66, 775	542, 115
Maryland	12	54, 029	404, 674	11	53, 090	398, 841
Massachusetts	7	133, 644	1, 443, 984	7	107, 502	1, 072, 008
Michigan	6	91, 468	844, 543	5	80, 241	630, 288
Minnesota	3	(1)	(1)	3	(1)	(1)
Missouri	13	316, 579	2, 319, 886	14	265, 771	1, 861, 105
Montana	2	(1)	(1)	2	(1)	(1)
Nevada	1	(1)	(1)	1	(1)	(1)
New Jersey	1	1, 644	15, 618	1	(1)	(1)
New Mexico	2	(1)	(1)	4	2, 369	21, 446
New York	12	104, 614	906, 021	10	83, 078	702, 475
North Carolina	1	(1)	(1)	1	(1)	(1)
Ohio	27	962, 415	7, 935, 656	23	736, 305	5, 711, 855
Oklahoma	1	(1)	(1)	1	(1)	(1)
Oregon	3	2, 486	40, 406	3	1, 741	25, 196
Pennsylvania	116	782, 915	5, 896, 752	115	633, 520	4, 661, 670
Porto Rico	12	10, 114	131, 887	12	9, 764	130, 680
Rhode Island	1	1, 885	24, 464	1	2, 638	34, 986
South Dakota	2	(1)	(1)	1	(1)	(1)
Tennessee	10	172, 936	1, 036, 405	10	147, 648	855, 452
Texas	6	97, 332	838, 470	6	74, 081	639, 821
Utah	10	46, 581	365, 055	11	27, 522	236, 607
Vermont	7	53, 128	505, 246	8	45, 963	406, 921
Virginia	29	153, 170	1, 061, 018	26	146, 996	960, 219
Washington	4	31, 598	324, 683	5	26, 913	266, 131
West Virginia	13	308, 600	1, 865, 531	13	228, 230	1, 394, 075
Wisconsin	18	130, 902	1, 094, 388	16	64, 989	598, 739
Wyoming	----------	----------	----------	1	(1)	(1)
Undistributed	----------	90, 125	830, 180	----------	70, 180	632, 482
	381	4, 269, 768	33, 478, 848	375	3, 387, 880	25, 616, 486

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[1] Included under "Undistributed."

Lime sold by producers in the United States, 1929 and 1930, by uses

Use	Quantity		Value	
	Percentage of total	Short tons	Total	Average
1929				
Agricultural	7.9	338,329	$2,387,901	$7.06
Building	38.4	1,640,827	14,303,539	8.72
Chemical:				
Glass works	1.8	75,283	544,760	7.24
Metallurgy	13.6	578,488	3,258,992	5.63
Paper mills	9.6	411,017	3,057,350	7.44
Refractory lime (dead-burned dolomite)	11.4	488,032	4,261,942	8.73
Sugar refineries	.5	20,758	249,190	12.00
Tanneries	1.6	67,046	516,207	7.70
Other uses [1]	15.2	649,988	4,898,967	7.54
Total chemical	53.7	2,290,612	16,787,408	7.33
	100.0	4,269,768	33,478,848	7.84
Hydrated lime (included in above totals)	36.3	1,550,771	12,771,525	8.24
1930				
Agricultural	10.1	343,111	2,372,779	6.92
Building	35.6	1,204,614	10,050,270	8.34
Chemical:				
Glass works	1.8	62,912	408,429	6.49
Metallurgy	12.3	415.692	2,371,222	5.70
Paper mills	11.2	378,721	2,652,232	7.00
Refractory lime (dead-burned dolomite)	10.4	351,740	3,045,082	8.66
Sugar refineries	.5	18,905	238,788	12.63
Tanneries	1.7	56,526	438,869	7.76
Other uses [1]	16.4	555,659	4,038,815	7.27
Total chemical	54.3	1,840,155	13,193,437	7.17
	100.0	3,387,880	25,616,486	7.56
Hydrated lime (included in above totals)	39.2	1,329,562	10,357,445	7.79

[1] Details of distribution shown in table on p. 254.

Lime sold by producers in the United States in 1930, by States and uses

State	Building		Agricultural		Chemical												Total	
					Glass works		Paper mills		Sugar refineries		Tanneries		Metallurgy		Other chemical			
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	32,843	$201,480	(1)	(1)	------	------	32,638	$194,268	(1)	(1)	(1)	(1)	60,701	$313,541	37,610	$213,958	164,822	$929,302
Arizona	11,683	135,472	(1)	(1)	(1)	(1)	------	------	------	------	(1)	(1)	19,165	121,821	4,626	58,468	35,642	317,881
Arkansas	12,477	113,451	------	------	------	------	(1)	(1)	------	------	------	------	------	------	(1)	(1)	30,349	241,938
California	34,553	336,141	1,481	$9,119	------	------	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	8,307	83,957	51,302	498,795
Colorado	2,504	25,276	4	60	------	------	------	------	------	------	------	------	2,851	30,750	1,418	17,070	6,777	73,156
Connecticut	24,379	252,495	(1)	(1)	------	------	(1)	(1)	------	------	------	------	------	------	(1)	(1)	28,489	282,521
Florida	(1)	(1)	(1)	(1)	------	------	------	------	------	------	------	------	------	------	------	------	(1)	(1)
Georgia	7,455	50,655	------	------	------	------	------	------	------	------	------	------	------	------	------	------	7,455	50,655
Hawaii	314	5,235	816	2,815	------	------	------	------	6,461	$83,993	------	------	------	------	------	------	7,591	92,043
Idaho	1,517	17,189	(1)	(1)	------	------	(1)	(1)	------	------	------	------	------	------	(1)	(1)	2,463	25,156
Illinois	31,535	283,273	(1)	(1)	------	------	5,926	41,331	------	------	6,977	$56,210	4,126	30,499	(1)	(1)	89,709	721,143
Indiana	15,378	100,505	5,514	34,880	1,863	$10,778	14,945	93,014	------	------	2,731	20,218	16,049	98,711	31,485	242,678	87,965	600,784
Kentucky	(1)	(1)	(1)	(1)	------	------	(1)	(1)	------	------	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Maine	17,111	155,986	(1)	(1)	------	------	(1)	(1)	------	------	(1)	(1)	------	------	(1)	(1)	66,775	542,115
Maryland	2,920	20,440	50,170	378,401	------	------	------	------	------	------	------	------	------	------	------	------	53,090	398,841
Massachusetts	71,012	797,622	4,498	25,338	------	------	15,217	117,671	(1)	(1)	(1)	(1)	(1)	(1)	13,968	103,878	107,502	1,072,008
Michigan	11,338	76,592	(1)	(1)	------	------	56,022	453,117	------	------	(1)	(1)	------	------	12,471	97,059	80,241	630,288
Minnesota	(1)	(1)	------	------	------	------	(1)	(1)	------	------	------	------	(1)	(1)	(1)	(1)	(1)	(1)
Missouri	69,371	578,377	1,162	6,028	(1)	(1)	13,309	82,879	(1)	(1)	2,121	16,207	49,413	279,274	129,471	891,037	265,771	1,861,105
Montana	(1)	(1)	------	------	------	------	------	------	------	------	------	------	(1)	(1)	(1)	(1)	(1)	(1)
Nevada	(1)	(1)	------	------	(1)	(1)	(1)	(1)	------	------	------	------	(1)	(1)	(1)	(1)	(1)	(1)
New Jersey	------	------	(1)	(1)	------	------	------	------	------	------	------	------	------	------	------	------	(1)	(1)
New Mexico	(1)	(1)	------	------	------	------	------	------	------	------	------	------	------	------	(1)	(1)	2,369	21,446
New York	19,841	136,373	8,282	58,335	(1)	(1)	13,285	115,336	(1)	(1)	3,393	36,860	18,578	157,818	(1)	(1)	83,078	702,475
North Carolina	(1)	(1)	------	------	------	------	------	------	------	------	(1)	(1)	------	------	------	------	(1)	(1)
Ohio	437,774	3,330,743	38,069	228,557	55,877	355,225	23,798	156,767	------	------	(1)	(1)	(1)	(1)	170,964	1,574,837	736,305	5,711,855
Oklahoma	(1)	(1)	------	------	------	------	------	------	------	------	------	------	------	------	(1)	(1)	(1)	(1)
Oregon	(1)	(1)	------	------	------	------	------	------	------	------	------	------	------	------	(1)	(1)	1,741	25,196
Pennsylvania	113,693	928,896	164,747	1,226,000	2,930	22,220	39,327	278,420	78	519	19,222	151,842	121,744	679,362	171,779	1,374,411	633,520	4,661,670
Porto Rico	535	8,361	2,070	13,330	------	------	------	------	6,929	106,389	------	------	------	------	230	2,600	9,764	130,680
Rhode Island	1,868	27,272	718	6,462	------	------	------	------	------	------	------	------	------	------	52	1,252	2,638	34,986
South Dakota	(1)	(1)	------	------	------	------	------	------	------	------	------	------	------	------	------	------	(1)	(1)
Tennessee	43,109	335,756	3,187	16,167	------	------	57,364	267,971	(1)	(1)	3,617	19,187	(1)	(1)	25,300	145,171	147,648	855,452
Texas	37,292	344,112	------	------	1,000	10,000	5,995	45,263	(1)	(1)	20	200	(1)	(1)	21,258	192,871	74,081	639,821
Utah	6,655	84,682	------	------	------	------	------	------	400	6,000	------	------	18,995	126,056	1,472	19,869	27,522	236,607
Vermont	23,341	240,522	3,179	12,157	------	------	7,298	54,477	------	------	2,326	24,604	2,948	20,734	6,871	54,427	45,963	406,921
Virginia	50,993	362,930	26,548	170,304	------	------	14,641	88,258	485	2,997	8,577	52,062	660	3,600	45,092	280,068	146,996	960,219

Washington	13,301	137,086	(1)	(1)			7,289	69,211	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	26,913	266,131
West Virginia	(1)	(1)	13,205	73,690	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	48,842	186,163	144,438	992,569	228,230	1,394,075
Wisconsin	51,917	450,882	(1)	(1)			10,072	81,286			(1)	(1)			2,527	62,817	64,989	598,739
Wyoming															(1)	(1)	(1)	(1)
Undistributed	57,905	512,466	19,461	111,136	1,242	10,206	61,595	512,963	4,552	38,890	7,542	61,479	51,620	322,893	78,060	674,900	70,180	632,482
	1,204,614	10,050,270	343,111	2,372,779	62,912	408,429	378,721	2,652,232	18,905	238,788	56,526	438,869	415,692	2,371,222	907,399	7,083,897	3,387,880	25,616,486

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[1] Included under "Undistributed."

BUILDING LIME

Sales of lime for construction amounted to 1,204,614 short tons, valued at $10,050,270, in 1930, a decrease of 27 per cent in quantity and 30 per cent in value from 1929. Lime of this class apparently was more affected by building-trade conditions, competition, overproduction, and price decreases than chemical or agricultural lime. In 1925, a peak year in the production (2,387,267 tons) of building lime, this class of lime represented 52.1 per cent of the total lime produced; in 1930 lime for construction represented 35.6 per cent of the total output. With the exception of California, Michigan, Virginia, and Washington, where there were small increases, all the principal producing States showed decreased output of building lime in 1930. Ohio, Pennsylvania, Massachusetts, Missouri, and Wisconsin were the largest producers of lime for building, but sales for this purposes from these States in 1930 decreased 26, 33, 19, 25, and 56 per cent, respectively, from those in 1929. The greater part of the lime produced in Wisconsin is shipped to Illinois, and lessened demand in this market is also indicated by a decrease of 39 per cent in the output of building lime in Illinois in 1930. Ohio produced 36 per cent of the building lime sold by producers in the United States in both 1929 and 1930; 98 per cent of this output in 1930 was hydrated lime, the greater part of which was sold as high-grade finishing lime. The sales from Ohio, classified according to kinds of lime, are given in the following table:

Lime sold by Ohio producers for construction, 1928–1930

	1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value
Quicklime	15,721	$99,363	12,676	$83,102	9,090	$62,472
Hydrated lime	642,144	5,513,124	576,802	4,645,914	428,684	3,268 271
	657,865	5,612,487	589,478	4,729,016	437,774	3,330,743

Of the total hydrated lime sold by producers in the United States in 1930, Ohio produced 471,785 tons (23 per cent less than in 1929) or 35 per cent. Of this total, 428,684 tons (91 per cent) were sold for construction and were distributed widely throughout continental United States. Figures of distribution of hydrated lime, as reported to the Bureau of Mines, presented for blocks of contiguous States roughly comprising various freight-rate zones, are given in the following table. Possibly some of the lime reported as supplied to the various districts is reshipped by dealers.

Shipments of hydrated lime from plants in the United States and in Ohio, 1929 and 1930, by destinations

Destination	From all plants		From Ohio plants		
	Short tons	Distribution (per cent)	Short tons	Distribution (per cent)	Group total (per cent)
1929					
Illinois, Indiana, Michigan, Ohio	389,273	25.1	274,269	44.6	70.5
Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania, West Virginia	630,038	40.6	224,123	36.4	35.6
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	78,394	5.1	25,019	4.1	31.9
Florida, Georgia, North Carolina, South Carolina, Virginia	121,095	7.8	31,163	5.1	25.7
Alabama, Kentucky, Louisiana, Mississippi, Tennessee	75,673	4.9	18,314	3.0	24.2
Arkansas, Iowa, Kansas, Minnesota, Missouri, Nebraska, Oklahoma, Texas, Wisconsin	179,948	11.6	31,663	5.1	17.6
Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming	60,753	3.9	2,998	.5	5.0
Undistributed and exports	15,597	1.0	7,523	1.2	48.2
	1,550,771	100.0	615,072	100.0	39.7
1930					
Illinois, Indiana, Michigan, Ohio	297,068	22.3	200,238	42.4	67.4
Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania, West Virginia	562,678	42.3	181,591	38.5	32.3
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	71,182	5.4	22,040	4.7	31.0
Florida, Georgia, North Carolina, South Carolina, Virginia	103,144	7.8	20,553	4.4	19.9
Alabama, Kentucky, Louisiana, Mississippi, Tennessee	51,076	3.8	12,869	2.7	25.2
Arkansas, Iowa, Kansas, Minnesota, Missouri, Nebraska, Oklahoma, Texas, Wisconsin	169,610	12.8	23,892	5.1	14.1
Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming	57,416	4.3	2,901	.6	5.1
Undistributed and exports	17,388	1.3	7,701	1.6	44.3
	1,329,562	100.0	471,785	100.0	35.5

CHEMICAL LIME

Sales of lime for chemical use amounted to 1,840,155 short tons, valued at $13,193,437, in 1930, a decrease of 20 per cent in quantity and 21 per cent in value from 1929. The demand for chemical lime in 1930, while better than that for building lime, was materially smaller than in 1929 for most of the chemicals shown. In 1921, 38 per cent (960,104 short tons) of the lime production was reported for use in the manufacture of chemicals; in 1930 more than 54 per cent was so reported. Pennsylvania, Ohio, West Virginia, and Missouri are the largest producers of chemical lime. The quantity and value of lime used in the various chemical industries, so far as reported to the Bureau of Mines, are given in the tables on pages 249 to 251 and in the following table:

Chemical lime sold by producers in the United States for "other uses," 1929 and 1930

Use	1929		1930	
	Short tons	Value	Short tons	Value
Alcohol manufacture and dehydration	308	$3, 705	2, 159	$17, 388
Alkali works (ammonia, soda, potash)	21, 167	133, 901	12, 635	84, 402
Bleaching powder	7, 852	59, 919	6, 899	50, 154
Bleach, liquid	18, 047	155, 384	13, 775	112, 680
Calcium acetate	21, 284	155, 783	3, 105	20, 040
Calcium carbide	30, 999	183, 388	26, 332	162, 311
Coke and gas manufacture (gas purification and plant by-products)	34, 227	240, 314	25, 215	181, 141
Glue	9, 887	75, 414	7, 194	51, 813
Insecticides (spraying materials)	26, 890	228, 713	25, 618	211, 639
Oil and fat manufacture	20, 985	171, 897	14, 053	117, 069
Paint (kalsomine, whitewash, varnish, etc.)	5, 111	55, 889	4, 109	38, 707
Rubber	4, 789	40, 501	4, 200	34, 928
Salt refining	2, 184	16, 201	3, 752	26, 568
Sand-lime and slag brick	42, 540	312, 427	29, 506	208, 164
Sanitation (sewage and garbage purification, etc.)	4, 537	30, 428	2, 898	17, 846
Silica brick	18, 391	139, 856	14, 929	105, 986
Soap	30, 575	171, 753	32, 860	176, 894
Textiles	2, 851	29, 386	2, 780	21, 891
Water purification	156, 117	1, 206, 603	161, 805	1, 201, 073
Wood distillation	4, 445	34, 293	2, 790	22, 663
Undistributed [1]	40, 991	367, 303	39, 423	348, 036
Unspecified	145, 811	1, 085, 909	119, 622	827, 422
	649, 988	4, 898, 967	555, 659	4, 038, 815

[1] Lime used in acid neutralization and drying, acetic acid, asphalt and fertilizer filler, baking powder, bichromate refining, buffing compounds, calcium phosphate, cellulose, corn products, creameries and dairies, cyanide manufacture, disinfectants (chloride of lime, etc.), dyes, explosives, filtration, flotation, flour mills, food products, gelatin (edible), magnesia, medicine, nitrogen manufacture, oil refining, oxygen purification, retarder, and stock food.

Sales of the various classes of chemical lime by States can not be given on account of the small number of firms reporting a given product. It is also necessary to classify much material as "unspecified," because many of the manufacturers do not report the uses of that part of their lime which they sell for chemical purposes. This lime is known to be applied to several of the uses enumerated, but the figures given are the best available.

AGRICULTURAL LIME AND OTHER LIMING MATERIALS

An increase of 1 per cent in quantity with a decrease of less than 1 per cent in value from 1929 marked the output of lime for agriculture in 1930, and sales amounted to 343,111 short tons, valued at $2,372,779 of which 27 per cent (91,521 tons) was quicklime and 73 per cent (251,590 tons) hydrated lime. Pennsylvania, Maryland, Ohio, and Virginia are the largest producers. Each of these States except Virginia showed increased output compared with 1929. The production of agricultural lime, as well as the output of pulverized limestone for agricultural purposes, has, in general, increased since 1924. However, the output of agricultural limestone in 1930—2,542,100 short tons, valued at $3,309,329—represented a decrease of 4 per cent in quantity and 12 per cent in value from 1929. Continued drought in many of the States that usually apply lime and limestone to the soil was a factor in the lessened demand for pulverized limestone and the apparently small increase in demand for agricultural lime. The quantity of lime reported as burned from oyster shells and used for liming land increased. Sales of calcareous marl (34,012 short tons, valued at $112,523), of which all but a negligible quantity sold as a filler was used for agriculture, decreased in comparison with 1929. The table following gives available data on the quantity and value of different kinds of liming materials sold by producers in 1929 and 1930. The method by which the effective lime content of the different forms of land lime is calculated was explained in Mineral Resources for 1921.

Agricultural lime and other liming materials sold by producers in the United States 1929 and 1930, by kinds

Kind	Short tons		Value	
	Gross	Effective lime content	Total	Average
1929				
Lime from limestone:				
Quicklime	89, 654	75, 400	$448, 634	$5. 00
Hydrated	248, 675	165, 000	1, 939, 267	7. 80
Lime from oyster shells [1]	14, 000	11, 800	119, 000	8. 50
Limestone (pulverized)	2, 654, 580	1, 141, 000	3, 764, 775	1. 42
Calcareous marl	38, 990	16, 600	130, 866	3. 36
1930				
Lime from limestone:				
Quicklime	91, 521	77, 000	512, 383	5. 60
Hydrated	251, 590	167, 000	1, 860, 396	7. 39
Lime from oyster shells [1]	15, 000	12, 600	135, 000	9. 00
Limestone (pulverized)	2, 542, 100	1, 093, 000	3, 309, 329	1. 30
Calcareous marl	34, 012	14, 500	112, 523	3. 31

[1] Partly estimated.

The figures in the preceding table do not include calcareous marl used for the manufacture of cement; they represent the output of fresh-water marl, chiefly for agriculture. The chief producing States in order of output in 1930 were California, Virginia, and West Virginia. The other States that produced in 1930 were Illinois, Montana, Nevada, North Carolina, Ohio, South Carolina, and Wisconsin.

HYDRATED LIME

Statistics of the output of hydrated lime include only the product made in hydrating machines; they exclude hand-slaked lime. The output in 1930—1,329,562 short tons, valued at $10,357,445—represented a decrease of 14 per cent in quantity and 19 per cent in value from 1929. However, the hydrated product was reported by six firms more in 1930 than in 1929. The greater part of the hydrated lime is sold for construction. In 1930, 59 per cent of the total was sold for construction, 22 per cent for the manufacture of chemicals, and 19 per cent for agriculture. In comparison with 1929, sales of hydrated lime for construction decreased 21 per cent in quantity and 26 per cent in value; sales for chemical purposes decreased 4 per cent in quantity and 9 per cent in value; and sales for agricultural use increased 1 per cent in quantity but declined 4 per cent in value.

Hydrated lime sold by producers in the United States, 1921–1930

Year	Number of plants in operation	Short tons	Value	
			Total	Average
1921	105	792, 970	$7, 421, 637	$9. 36
1922	114	1, 106, 063	9, 868, 980	8. 92
1923	121	1, 225, 928	12, 229, 598	9. 98
1924	120	1, 316, 664	13, 199, 846	10. 03
1925	134	1, 560, 848	15, 287, 461	9. 79
1926	147	1, 606, 811	15, 182, 460	9. 45
1927	157	1, 596, 906	14, 581, 695	9. 13
1928	164	1, 612, 818	13, 540, 215	8. 40
1929	157	1, 550, 771	12, 771, 525	8. 24
1930	163	1, 329, 562	10, 357, 445	7. 79

Hydrated lime sold by producers in the United States, 1929 and 1930, by States

State	1929		1930	
	Short tons	Value	Short tons	Value
Alabama	40, 688	$308, 978	21, 380	$136, 743
California	12, 305	152, 131	(1)	(1)
Florida	(1)	(1)	(1)	(1)
Georgia	10, 308	74, 814	7, 455	50, 655
Hawaii	6, 350	76, 879	7, 577	91, 833
Illinois	33, 659	274, 001	32, 322	257, 925
Indiana	50, 004	363, 775	42, 126	309, 734
Maryland	35, 869	286, 972	34, 287	272, 262
Massachusetts	16, 731	128, 547	20, 432	134, 901
Michigan	17, 527	205, 786	14, 816	144, 402
Missouri	107, 759	918, 796	102, 166	805, 090
New York	46, 665	346, 879	37, 586	270, 789
Ohio	615, 072	4, 886, 355	471, 785	3, 532, 337
Pennsylvania	259, 251	2, 232, 117	234, 192	1, 904, 179
Rhode Island	806	7, 254	718	6, 462
Tennessee	41, 021	318, 968	36, 670	273, 535
Texas	40, 149	382, 199	32, 525	316, 999
Vermont	10, 423	84, 825	10, 052	76, 043
Virginia	53, 330	381, 488	63, 253	413, 525
West Virginia	51, 426	346, 105	47, 343	301, 063
Wisconsin	11, 668	103, 005	10, 075	87, 410
Undistributed [2]	89, 760	891, 651	102, 802	971, 558
	1, 550, 771	12, 771, 525	1, 329, 562	10, 357, 445

[1] Included under "Undistributed."

[2] 1929: Arizona, Arkansas, Colorado, Connecticut, Florida, Kentucky, Maine, Minnesota, Montana, Nevada, New Jersey, North Carolina, Oregon, Porto Rico, South Dakota, Utah, and Washington; 1930: Arizona, Arkansas, California, Colorado, Connecticut, Florida, Kentucky, Maine, Minnesota, Montana, Nevada, New Jersey, North Carolina, Oklahoma, Oregon, Porto Rico, South Dakota, Utah, and Washington.

Hydrated lime sold by producers in the United States, 1929 and 1930, by uses

Use	1929		1930	
	Short tons	Value	Short tons	Value
Agricultural	248, 675	$1, 939, 267	251, 590	$1, 860, 396
Building	989, 687	8, 150, 887	779, 102	6, 045, 149
Chemical:				
Glass works	4, 871	45, 698	3, 002	26, 951
Metallurgy	18, 638	162, 801	20, 092	174, 441
Paper mills	24, 728	210, 783	34, 815	296, 183
Sugar refineries	10, 812	113, 291	9, 686	109, 538
Tanneries	24, 880	195, 922	18, 266	144, 978
Other uses	228, 480	1, 952, 876	213, 009	1, 699, 809
Total chemical	312, 409	2, 681, 371	298, 870	2, 451, 900
	1, 550, 771	12, 771, 525	1, 329, 562	10, 357, 445

EXPORTS AND IMPORTS [2]

Lime exported from the United States in 1930 amounted to 14,536 short tons, valued at $192,421, a decrease of 16 per cent in quantity and 20 per cent in value compared with 1929. Lime (hydrated and "other" lime, exclusive of dead-burned dolomite) imported for consumption amounted to 20,706 short tons, valued at $278,897, a decrease of 4 per cent in quantity and 29 per cent in value. Hydrated lime decreased 47 per cent in quantity imported and "other" lime increased 15 per cent. For a portion only of 1930, data on imports of dead-burned or sintered dolomite, used as a refractory, are available. Prior to the tariff of June 18, 1930, shipments of this product, imported from Canada and Czechoslovakia, were not recorded separately.

Lime exported from the United States, 1921–1930

Year	Short tons	Value	Year	Short tons	Value
1921	5, 192	$109, 769	1926	12, 960	$191, 768
1922	8, 289	116, 649	1927	15, 478	210, 977
1923	11, 789	170, 289	1928	18, 188	245, 004
1924	14, 905	212, 340	1929	17, 334	239, 440
1925	14, 800	218, 696	1930	14, 536	192, 421

Lime exported from the United States, 1929 and 1930, by countries

Country	1929		1930	
	Short tons	Value	Short tons	Value
North America:				
Canada	9, 176	$105, 923	8, 110	$84, 822
Central America—				
British Honduras	(a)	4	1	26
Costa Rica	5	127		
Guatemala	11	263	1	27
Honduras	298	4, 642	355	5, 918
Nicaragua	94	2, 447	68	1, 802
Panama	101	2, 423	145	2, 960
Salvador	57	1, 145	21	419
Mexico	2, 708	30, 155	2, 249	23, 048
Newfoundland and Labrador	91	1, 620	80	1, 440
West Indies—				
British—				
Bermudas			7	162
Jamaica	246	5, 054	76	1, 434
Other British	128	2, 903	82	1, 938
Cuba	172	3, 297	429	8, 485
Dominican Republic	1, 184	12, 145	894	11, 747
Netherland	107	3, 679	21	595
Virgin Islands of the United States	33	1, 074	39	1, 264
South America:				
Argentina	3	173	1	69
Brazil	6	241	1	35
Chile	1, 126	15, 944	206	4, 038
Colombia	125	2, 568	99	2, 238
Ecuador	20	496	89	2, 226
Guiana—Surinam (Netherland)			2	44
Peru	803	16, 607	984	18, 028
Venezuela	84	2, 185	40	1, 033
Europe:				
France	21	843		
Italy			10	121
Soviet Russia in Europe			1	32
Sweden	52	2, 222	31	1, 441
United Kingdom	9	289	51	1, 038

[a] Less than 1 ton.

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[2] Figures on exports and imports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Lime exported from the United States, 1929 and 1930, by countries—Continued

Country	1929		1930	
	Short tons	Value	Short tons	Value
Asia:				
China	3	$86	1	$17
Japan	201	9,934	359	13,816
Persia			22	808
Philippine Islands	438	9,611	49	970
Africa:				
British—				
West ("Other")	3	116		
Liberia	9	310	2	55
Oceania:				
Australia	13	772	3	110
French Oceania	7	136	5	105
New Zealand			2	96
Other	([a])	6	([a])	14
	17,334	239,440	14,536	192,421

[a] Less than 1 ton.

Lime imported for consumption in the United States, 1926–1930

Year	Hydrated lime		Other lime		Dead-burned dolomite		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1926	4,516	$72,597	14,186	$274,372	([1])	([1])	18,702	$346,969
1927	5,010	80,440	14,557	276,396	([1])	([1])	19,567	356,836
1928	5,707	88,738	12,614	255,558	([1])	([1])	18,321	344,296
1929	6,347	97,238	15,154	293,498	([1])	([1])	21,501	390,736
1930	3,336	40,381	17,370	238,516	[2] 3,024	[2] $77,918	23,730	356,815

[1] Not separately recorded.
[2] June 18 to Dec. 31; not separately recorded prior to change in tariff.

Lime (exclusive of dead-burned dolomite) imported into the United States, 1929 and and 1930, by countries and districts

[General imports]

Country	District	1929		1930	
		Short tons	Value	Short tons	Value
Canada	Dakota			135	$168
	Los Angeles			2,221	35,329
	Maine and New Hampshire	104	$1,595	214	2,946
	Oregon	242	5,174		
	San Francisco	3,342	52,364		
	Vermont	32	438	38	427
	Washington	17,403	324,133	18,023	237,844
		21,123	383,704	20,631	276,714
Germany	New York	36	1,381	29	1,239
Italy	do	1	9		
Japan	Washington			([1])	20
Mexico	El Paso	7	35		
United Kingdom	New York	13	711		
	Philadelphia	68	1,033	46	924
	Washington	253	3,863		
		334	5,607	46	924
		21,501	390,736	20,706	278,897.

[1] Less than 1 ton.

TARIFF

The tariff act of June 18, 1930, made no change in the duties on hydrated lime and lime (n. s. p. f.), which were 12 cents a hundred pounds on hydrated lime and 10 cents a hundred pounds on lime (n. s. p. f.). Dead-burned or sintered dolomite, which was not recorded separately prior to the act of 1930, is dutiable at the rate of 30 per cent ad valorem under the new tariff.

SHIPMENTS

Shipments of lime, as reported to the Bureau of Mines by the producers, have been combined in the tables following to show for 1930 the movement of this product according to its origin (sales), shipments into State, shipments from State, and probable consumption or supply of lime in each State, and according to its origin in and destination in State groups which approximately comprise various freight-rate zones. The figures in the second of these tables do not cover an inconsiderable quantity of lime (1 per cent of the total), comprising the production in Hawaii and Porto Rico, the shipments abroad, and the product for which distribution is not recorded. No account is taken of reshipments.

Lime supplies available for consumption in continental United States in 1930, by States, in short tons

State	Sales by producers	Shipments from State	Shipments into State	Supply			
				Hydrated lime	Quicklime	Total	Pounds per capita [1]
Alabama	164,822	45,804	9,430	11,976	116,472	128,448	97
Arizona	35,642	11,139	74	2,002	22,575	24,577	113
Arkansas	30,349	18,786	2,735	4,775	9,523	14,298	15
California	51,302	5,895	30,875	23,660	52,622	76,282	27
Colorado	6,777	754	6,816	6,178	6,661	12,839	25
Connecticut	28,489	18,769	18,522	12,450	15,792	28,242	35
Delaware	-----	-----	39,632	15,652	23,980	39,632	333
District of Columbia	-----	-----	13,977	11,667	2,310	13,977	58
Florida	(2)	-----	(2)	16,429	8,871	25,300	35
Georgia	7,455	1,741	21,456	21,313	5,857	27,170	19
Idaho	2,463	1,286	1,122	596	1,703	2,299	10
Illinois	89,709	44,051	137,934	68,326	115,266	183,592	48
Indiana	87,965	52,604	44,351	44,412	35,300	79,712	49
Iowa	-----	-----	48,161	17,568	30,593	48,161	39
Kansas	-----	-----	33,014	19,245	13,769	33,014	35
Kentucky	(2)	(2)	38,068	10,293	29,636	39,929	30
Louisiana	-----	-----	63,079	8,186	54,893	63,079	60
Maine	66,775	20,919	22,188	15,002	53,042	68,044	170
Maryland	53,090	21,137	75,766	52,572	55,147	107,719	132
Massachusetts	107,502	79,622	49,567	30,775	46,672	77,447	36
Michigan	80,241	36,969	104,871	60,521	87,622	148,143	61
Minnesota	(2)	(2)	10,345	12,273	11,410	23,683	18
Mississippi	-----	-----	17,237	5,635	11,602	17,237	17
Missouri	265,771	194,099	9,944	31,277	50,339	81,616	45
Montana	(2)	-----	(2)	2,059	7,398	9,457	35
Nebraska	-----	-----	11,816	8,280	3,536	11,816	17
Nevada	(2)	(2)	1,584	1,040	1,194	2,234	49
New Hampshire	-----	-----	11,752	3,560	8,192	11,752	51
New Jersey	(2)	-----	(2)	93,173	43,159	136,332	68
New Mexico	2,369	400	10,385	1,525	10,829	12,354	58
New York	83,078	30,400	293,261	169,284	176,655	345,939	55
North Carolina	(2)	(2)	37,656	27,898	13,724	41,622	26
North Dakota	-----	-----	7,020	5,263	1,757	7,020	21
Ohio	736,305	496,345	77,493	123,969	193,484	317,453	96
Oklahoma	(2)	-----	(2)	13,694	9,161	22,855	19
Oregon	1,741	632	7,446	3,769	4,786	8,555	18
Pennsylvania	633,520	239,928	204,972	204,971	393,593	598,564	124

[1] Based on Bureau of the Census preliminary statement.
[2] Included under "Undistributed."

Lime supplies available for consumption in continental United States in 1930, by States, in short tons—Continued

State	Sales by producers	Shipments from State	Shipments into State	Supply			
				Hydrated lime	Quicklime	Total	Pounds per capita
Rhode Island	2,638	214	15,134	8,174	9,384	17,558	51
South Carolina	-----	-----	9,475	5,770	3,705	9,475	11
South Dakota	(2)	-----	(2)	2,302	1,890	4,192	12
Tennessee	147,648	93,553	9,174	14,986	48,283	63,269	49
Texas	74,081	22,033	4,172	33,493	22,727	56,220	19
Utah	27,522	1,955	369	4,549	21,387	25,936	103
Vermont	45,963	43,193	1,277	1,221	2,826	4,047	23
Virginia	146,996	100,794	37,014	31,734	51,482	83,216	69
Washington	26,913	7,481	4,433	3,543	20,322	23,865	31
West Virginia	228,230	192,517	37,554	15,359	57,908	73,267	85
Wisconsin	64,989	27,830	63,564	29,005	71,718	100,723	69
Wyoming	(2)	-----	(2)	770	343	1,113	10
Undistributed	70,180	32,229	181,113	-----	-----	-----	-----
	3,370,525	[3] 1,843,079	1,825,828	1,312,174	2,041,100	3,353,274	55

[2] Included under "Undistributed."

[3] Includes 17,251 tons of lime exported or unspecified by producers as to destination.

Lime shipped in continental United States in 1930, by origin and destination of shipments, in short tons

Destination	Illinois, Indiana, Michigan, Ohio			Maryland, New Jersey, New York, Pennsylvania, West Virginia			Connecticut, Maine, Massachusetts, Rhode Island, Vermont			Florida, Georgia, North Carolina, Virginia		
	Hydrated lime	Quick-lime	Total	Hydrated lime	Quick-lime	Total	Hydrated lime	Quick-lime	Total	Hydrated lime	Quick-lime	Total
Illinois, Indiana, Michigan, Ohio	262, 638	301, 391	564, 029	8, 905	45, 174	54, 079	--------	5	5	421	1, 246	1, 667
Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania, West Virginia	182, 297	64, 243	246, 540	335, 359	568, 407	903, 766	17, 799	72, 519	90, 318	26, 128	47, 114	73, 242
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	22, 040	121	22, 161	3, 845	18, 416	22, 261	43, 277	116, 700	159, 977	450	523	973
Florida, Georgia, North Carolina, South Carolina, Virginia	20, 563	1, 667	22, 230	6, 030	7, 250	13, 280	779	157	936	50, 170	38, 353	88, 523
Alabama, Kentucky, Louisiana, Mississippi, Tennessee	14, 348	17, 203	31, 551	--------	100	100	--------	--------	--------	101	--------	101
Arkansas, Iowa, Kansas, Minnesota, Missouri, Nebraska, Oklahoma, Texas, Wisconsin	47, 006	47, 611	94, 617	--------	1, 631	1, 631	--------	--------	--------	--------	--------	--------
Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming	4, 386	121	4, 507	--------	--------	--------	--------	--------	--------	--------	--------	--------

Destination	Alabama, Kentucky, Tennessee			Arkansas, Minnesota, Missouri, Oklahoma, Texas, Wisconsin			Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, South Dakota, Utah, Washington			United States		
	Hydrated lime	Quick-lime	Total	Hydrated lime	Quick-lime	Total	Hydrated lime	Quick-lime	Total	Hydrated lime	Quick-lime	Total
Illinois, Indiana, Michigan, Ohio	855	5, 768	6, 623	24, 249	78, 088	102, 337	--------	--------	--------	297, 068	431, 672	728, 740
Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania, West Virginia	--------	--------	--------	1, 095	469	1, 564	--------	--------	--------	562, 678	752, 752	1, 315, 430
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	--------	--------	--------	1, 570	148	1, 718	--------	--------	--------	71, 182	135, 908	207, 090
Florida, Georgia, North Carolina, South Carolina, Virginia	25, 582	35, 181	60, 763	20	81	101	--------	--------	--------	103, 144	82, 689	185, 833
Alabama, Kentucky, Louisiana, Mississippi, Tennessee	33, 136	215, 178	248, 314	3, 491	28, 405	31, 896	--------	--------	--------	51, 076	260, 886	311, 962
Arkansas, Iowa, Kansas, Minnesota, Missouri, Nebraska, Oklahoma, Texas, Wisconsin	100	41	141	122, 264	173, 393	295, 657	240	100	340	169, 610	222, 776	392, 386
Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming	--------	--------	--------	8, 002	16, 480	24, 482	45, 028	137, 816	182, 844	57, 416	154, 417	211, 833

ASBESTOS[1]

By OLIVER BOWLES and B. H. STODDARD

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GENERAL SITUATION

The quantity of asbestos produced in the United States showed a marked increase in 1930. In comparison with 1929, total sales by producers increased 34 per cent in quantity but decreased 18 per cent in value. The increase in sales by domestic producers is remarkable in view of the general depressed condition of the world asbestos industry, which was characterized by overproduction, lessened demand, declining prices, and an accumulation of stocks at the end of the year.

As the United States produces less than 2 per cent of its asbestos requirements, supplies are obtained from other countries, principally Canada; South Africa and Russia are also important sources of supply. Imports of asbestos into the United States in 1930 decreased 20 per cent in quantity and 37 per cent in value as compared with 1929. Imports from all countries decreased except those from Soviet-Russia in Europe and those from the United Kingdom (original source, probably Southern Rhodesia and the Union of South Africa).

PROPERTIES

Asbestos is distinguished from other minerals chiefly by a fibrous structure, which is responsible for its commercial value. Unlike other minerals, asbestos may be spun into yarn or thread, woven into cloth, or felted into sheets or packings in the same way that a vegetable fiber may be treated; but, unlike vegetable fiber, it consists of inert incombustible mineral matter and is therefore fireproof, weatherproof, and highly resistant to chemical action.

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[1] Work on manuscript completed September, 1931.

VARIETIES

The term "asbestos" was originally applied to fibrous amphibole, a variety of minor importance at present. The term is now applied to any mineral that may be separated into more or less flexible fibers. At least six commercial types of fiber are known as asbestos. Their composition and general character are given in the following paragraphs:

Chrysotile.—A hydrous magnesium silicate represented by the chemical formula $H_4Mg_3Si_2O_9$. It has the same composition as serpentine, with which it is always associated. Chrysotile is the most important of all the commercial varieties and provides most of the spinning fiber.

Anthophyllite.—An anhydrous iron-magnesium silicate having the composition $(Fe, Mg)SiO_3$. The fiber is usually brittle and of low tensile strength. It is used for nonspinning purposes and is more resistant than chrysotile to the action of acids and heat.

Crocidolite.—A soda-bearing amphibole having the composition $NaFe(SiO_3)_2.FeSiO_3$. On account of its characteristic color it is commonly called "blue" asbestos. It is used for spinning purposes.

Amosite.—An iron-rich anthophyllite containing very little magnesium. It is a spinning asbestos notable for its great length of fiber.

Tremolite and actinolite.—The former, having the composition $CaMg_3(SiO_3)_4$, and the latter, chemically $Ca(Mg, Fe)_3(SiO_3)_4$, are amphiboles that may be classed as asbestos when occurring in fibrous form; in fact, they are the minerals to which the term "asbestos" was first applied. The fibers are weak and brittle and now have little value commercially. A small production of actinolite has been reported from Canada.

USES

Asbestos is one of the most important fireproofing materials known, and it is largely from the best chrysotile that heat and fire resistant textile products are made. It falls into two divisions, the spinning and the nonspinning fibers, according to use. Chrysotile, crocidolite, and amosite have sufficient strength and flexibility for spinning if the fiber is long enough, and the shorter fibers of these varieties are used for nonspinning purposes. Chrysotile is usually regarded as the highest grade of spinning fiber, although with improved processes of fiberization and treatment crocidolite (blue asbestos) and amosite are giving good results. Anthophyllite is chiefly nonspinning even though the fiber may be of great length, as it is usually very weak and brittle.

Fiber of spinning quality is woven into various fabrics, the chief of which is that used for automobile brake-band linings. Other important uses for asbestos fabrics are in clutch facings, packings, theater curtains, and fireproof suits and gloves. Grades of asbestos shorter than those employed in spinning are used in compressed sheets, paper, and asbestos-cement shingles. On account of its heat-insulating and fire-resisting properties, asbestos paper is used chiefly for the manufacture of 3-ply air cell and other types of pipe covering, as sheeting between floors, and for lining stoves, safes, filing cabinets, etc.

The shortest grades are used in asbestos cement, fireproof paints, packings, and insulating materials. The many other uses are too numerous to mention in this report.

GRADES

The highest grades of asbestos are known as crude fibers; these are hand cobbed and are not passed through crushers or mills. Crudes and the highest grade mill fiber provide material for spinning.

Mill stock is the product obtained by crushing the rock, passing it through beaters, and removing the fiber by screening and air separation. It is graded and classified according to length. Canadian fiber is graded in a standard testing machine that consists of four boxes, three of which have screen bottoms. The top screen is 2-mesh, 11-gage; the second, 4-mesh, 17-gage; and the third, 10-mesh, 20-gage. The fourth or lowest box retains the finest materials. Sixteen ounces of asbestos are placed in the top box, and the entire set is shaken for 2 minutes at 300 revolutions per minute on a machine with a ¾-inch eccentric. The residue in each box is weighed, and the fiber is graded by the amount that remains in each box. The longer the fiber, the larger is the proportion that remains in the upper boxes.

The following table gives the screen test for the various grades:

Grades of mill fiber

Grades according to use	Screen test
Long spinning fiber	2-8 - 4 - 2
Medium spinning and compressed sheet fiber	0-8 - 6 - 2
Shingle stock	0-1½- 9½- 5
Paper and millboard stocks	0-0 -10 - 6
Cement stock	0-0 - 5 -11

PRODUCTION

The quantity of asbestos sold by producers in the United States in 1930 exceeded that in 1929 by more than 30 per cent. The total in 1930 was 4,242 short tons, valued at $289,284. By far the larger part (3,653 tons, valued at $273,292) was the more valuable chrysotile, mined in Arizona, California, and Vermont. Notable activity of the Vermont Asbestos Corporation was the chief cause of increased sales of domestic asbestos during 1930. Anthophyllite (amphibole) was mined in Georgia, Maryland, and Washington; these three States produced 589 tons, valued at $15,992, representing decreases of 49.7 per cent in quantity and 52.1 per cent in value as compared with 1929.

In 1930 the average value per ton of chrysotile, including all grades of crude and mill fiber, was $74.81; in 1929 the corresponding value was $160.15. The marked decline in average value is partly accounted for by the decreased production of high-grade crudes Nos. 1 and 2 mined only in Arizona, and partly by the increased production of the lower grades of mill fiber produced in Arizona, California, and Vermont. The average value per ton of anthophyllite (amphibole) was $25 to $30.

Asbestos sold by producers in the United States, 1921–1930, by varieties

Year	Chrysotile		Amphibole		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1921	438	$313,268	393	$23,700	831	$336,968
1922	25	3,320	42	6,800	67	10,120
1923	69	4,433	158	5,193	227	9,626
1924	173	33,941	127	8,585	300	42,526
1925	93	40,750	1,165	10,950	1,258	51,700
1926	(1)	(1)	(1)	(1)	1,358	134,731
1927	(1)	(1)	(1)	(1)	2,981	336,882
1928	(1)	(1)	(1)	(1)	2,239	351,178
1929	1,983	317,584	1,172	33,420	3,155	351,004
1930	3,653	273,292	589	15,992	4,242	289.284

[1] Bureau of Mines not at liberty to publish figures.

Following is a list of producers of asbestos in the United States making shipments in 1930:

Producers of asbestos in the United States making shipments in 1930

Name and address	Location of property	Variety of asbestos mined
ARIZONA		
Arizona Asbestos Association (subsidiary of Johns-Manville Corporation), Globe.	Chrysotile, on Ash Creek, Gila County.	Chrysotile (in limestone), cross fiber.
Emsco Asbestos Co., Downey, Calif.	Gila County; nearest post office, Rice.	Chrysotile (in limestone).
Keasbey & Mattison Co., Ambler, Pa.	do	Chrysotile (in limestone), cross fiber.
CALIFORNIA		
Jones Bros. Asbestos Supply Co., 370 Second Street, San Francisco.	Trinity County; nearest post office, Carrville.	Chrysotile.
GEORGIA		
Clayton Paving Co., 615 Independent Life Building, Nashville, Tenn.	Sall Mountain, White County.	Amphibole (anthophyllite), mass fiber.
MARYLAND		
Powhatan Mining Corporation, Woodlawn, Baltimore.	1 mile northwest from Pylesville.	Amphibole (anthophyllite), slip fiber.
VERMONT		
Vermont Asbestos Corporation, 89 Broad Street, Boston, Mass.	Eden, Lamoille County	Chrysotile, cross and slip fiber.
WASHINGTON		
Asbestos-Talc Products of Washington (Inc.), Burlington.	Near Burlington, Skagit County.	Amphibole.

REVIEW BY STATES

Arizona.—In 1930 each producing company in Arizona increased its output over 1929; the total for the State, however, decreased as the number of operators dropped from six in 1929 to three in 1930. Practically the entire output consisted of the highest grades of crude chrysotile. Operations were conducted by the Arizona Asbestos Association (a subsidiary of the Johns-Manville Corporation), the Emsco Asbestos Co., and the Keasbey & Mattison Co., whose properties are listed in the foregoing statement. On account of adverse business conditions one of the largest operators in this field closed down in April, pending industrial improvement. Arizona produces a high-grade chrysotile asbestos that is suitable for spinning and is used extensively in making very fine yarns.

California.—Jones Bros. Asbestos Supply Co., a new operator, leased a property in Trinity County near Carrville, and marketed a few tons of mill fiber.

Georgia.—Activities in Georgia were confined to the operations of one firm—the Clayton Paving Co. Anthophyllite was sold by the company from its property near Helen, White County.

Maryland.—The Powhatan Mining Corporation operated, as usual, the Jenkins mine near Pylesville. The product was used in the chemical industry.

North Carolina.—The Amphibole Asbestos Corporation, Chicago, Ill., which purchased in 1929 the Fox estate, Burnsville, reported that plans are being made to develop the property as soon as business conditions show sufficient improvement. The corporation also intends to erect a plant for the marketing of the asbestos, mica, and other minerals that have been exposed by development work. A 60-foot shaft has been driven into the pegmatite dike, and when economic conditions become more encouraging it may be sunk to a much greater depth.

South Carolina.—S. O. Cooper, Six Mile, reported the discovery of a good grade of amphibole on his property on Crow Creek near Six Mile, Pickens County. No commercial output of asbestos was reported from this State.

Vermont.—A large increase in production of the mill fiber variety of asbestos in Vermont was reported by the Vermont Asbestos Corporation from its property in Lamoille County near Hyde Park. As compared with 1929, this corporation more than doubled the quantity and nearly doubled the value of its sales in 1930. Three grades of mill fiber were marketed. Mining was conducted by the open quarry method.

Washington.—Asbestos was mined in Washington by a new operator—the Asbestos-Talc Products of Washington (Inc.). The company, which began operations late in 1930, produced a small tonnage of amphibole which was sold for use in insulating materials for buildings and in insulating cement for boiler covering. A mill for treating asbestos-bearing rock and preparing the fiber for market was erected and equipped during 1930.

MARKET CONDITIONS

Foreign supplies of asbestos are exceedingly important to the United States, for although this country leads all others in the manufacture of asbestos products it produces less than 2 per cent of its requirements. Canada has for many years been the chief source of supply of short-fiber asbestos. Increasing quantities of the longer fibered varieties, especially those used for spinning purposes, are obtained from Africa and Russia.

Price quotations for Canadian fiber fell sharply during the year. Crude No. 1, quoted at $550 to $750 a ton in January, dropped to $350 to $400 a ton at the end of the year. Other grades dropped similarly; crude No. 2, which ranged from $450 to $575 in January, was quoted at $250 to $275 in December. Shingle stocks, ranging from $55 to $115 a ton in January, fell to between $45 and $65; cement stock dropped from $25 to between $15 and $20. With a declining market purchases were made only for immediate needs, which had a further depressing effect upon prices. Inasmuch as Russian production is increasing and African interests have been consolidated, a lower level of prices is anticipated than has prevailed in the past for high-grade fibers.

Asbestos has been quoted in the New York market reports under mason's materials at $2.50 a bag, delivered. The material thus quoted is Russian asbestos, which is imported in bags weighing 112½ pounds gross, or 110 pounds net.

OUTSTANDING EVENTS

The outstanding factor in 1930 was the world-wide trade recession, which forced reduction of output in nearly every asbestos-producing district except Russia. Curtailment in automobile manufacture and in the building trades depressed both the spinning and nonspinning fiber markets.

Molded automobile brake linings are now widely used, and their introduction has opened to nonspinning fibers a field formerly occupied by spinning fibers exclusively. On the other hand, the adoption of free wheeling is expected to increase the demand for brake linings of all kinds.

A wider use for asbestos is in prospect in the manufacture of asbestos-cement pipes for water mains, gas mains, and sewers. It is claimed that they cost less than cast-iron pipes and are more resistant to acids, better heat insulators, noncorrosive, electrically nonconductive, light in weight, and easily placed and joined. Their elasticity makes them less liable to leakage through traffic vibration. A standard European pipe consists of 80 per cent of cement and 20 per cent of asbestos.

Corrugated sheeting, consisting of cement and asbestos, is finding important use in the construction of chemical plants or other buildings exposed to corrosive atmospheres. Asbestos-cement wall tiles in a wide range of colors have recently been marketed. A proposed use of asbestos in automobile bodies points to a possible wider use of short-fibered varieties.

No event has created more interest among producers and consumers of asbestos than the enormously increased production in Russia. From a production of 26,492 metric tons in 1928 an estimated increase to 56,000 tons in 1929 has been reported. The 5-year plan contemplates increasing this amount to at least 90,000 tons a year. Asbestos producers throughout the world are viewing with some alarm the probable effect of throwing upon the market a supply of spinning fiber, so far in excess of the expected demands of industry. The declining prices of 1930 in consuming countries are attributed in some measure to Russian exports.

Eternit (Inc.), the largest manufacturer of asbestos-cement products in the United States, has been purchased by the Rubberoid Co. of New York. The company maintains an association with the Société Anonyme Eternit of Belgium.

With the acquisition by Turner & Newall (Ltd.), Rochdale, England, of the Quasi-Arc Co., pioneers of the electric-welding industry, the position of that far-reaching company has been strengthened further.

Production in Vermont of an increasing tonnage of short-fiber chrysotile is a circumstance of interest, because heretofore practically the entire requirements of this class of raw materials for the United States have been obtained from Canada.

IMPORTS AND EXPORTS[2]

As the United States is the world's largest consumer of asbestos and produces only a very small part of its requirements (in 1930, 1.7 per cent), it is dependent upon foreign sources of supply, chiefly Canada. Of the 1930 Canadian total of 242,114 short tons, valued at $8,390,163, the United States took 200,068 tons (82.6 per cent), valued at $5,466,783. In 1929 the United States imported 82.4 per cent of the total Canadian production.

The following table shows the tonnage and value of unmanufactured asbestos imported for consumption in the United States over a number of years:

Asbestos (unmanufactured) imported for consumption in the United States, 1921–1930

Year	Short tons	Value	Year	Short tons	Value
1921	72,463	$2,948,302	1926	257,621	$8,142,505
1922	149,427	5,144,700	1927	223,693	8,150,340
1923	212,420	7,445,143	1928	230,595	9,017,891
1924	183,250	5,602,945	1929	262,427	11,153,017
1925	230,520	7,134,302	1930	208,681	7,064,824

In the following table of general imports into the United States in 1929 and 1930 the countries listed are those from which the asbestos was last shipped; they are not always the countries in which the asbestos was produced.

Asbestos (unmanufactured) imported into the United States, 1929 and 1930, by countries and classes

[General imports]

Country	Crude (including blue fiber)		Mill fiber		Stucco and refuse		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1929								
Africa:								
British—Union of South Africa	3,680	$585,240					3,680	$585,240
Portuguese—Mozambique	4,524	1,578,514					4,524	1,578,514
Belgium	348	55,125					348	55,125
Canada	6,651	1,545,892	95,382	$4,575,438	150,034	$2,242,211	252,067	8,363,541
Germany	1,174	361,446					1,174	361,446
Italy	122	31,212	1	45	33	1,167	156	32,424
Soviet Russia in Europe	252	111,290					252	111,290
United Kingdom	225	65,341	1	96			226	65,437
	16,976	4,334,060	95,384	4,575,579	150,067	2,243,378	262,427	11,153,017

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[2] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Asbestos (unmanufactured) imported into the United States, 1929 and 1930, by countries and classes—Continued

Country	Crude (including blue fiber)		Mill fiber		Stucco and refuse		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1930								
Africa:								
British—Union of South Africa	1,907	$297,749					1,907	$297,749
Portuguese—Mozambique	1,303	432,525					1,303	432,525
Canada	1,945	536,301	69,012	$3,119,894	129,111	$1,810,588	200,068	5,466,783
France	1	267					1	267
Germany	390	83,897			2	84	392	83,981
Italy	48	8,752					48	8,752
India (British)	1	55					1	55
Soviet Russia in Europe	4,534	660,559					4,534	660,559
United Kingdom	410	113,684			17	469	427	114,153
	10,539	2,133,789	69,012	3,119,894	129,130	1,811,141	208,681	7,064,824

The figures in the foregoing table indicate that in 1930 imports of asbestos from all countries into the United States decreased, as compared with 1929, except those from Soviet Russia in Europe and those from the United Kingdom (original source, probably British South Africa). Imports from British and Portuguese Africa, which include high-grade asbestos produced in Southern Rhodesia and the Union of South Africa, decreased 60.9 per cent in quantity and 66.2 per cent in value; those from Canada (crude and mill fiber, stucco, and refuse) decreased 20.6 per cent in quantity and 34.6 per cent in value; while those from Soviet Russia increased 17 fold in quantity and five fold in value. Imports of Canadian crudes decreased 70.8 per cent in quantity and 65.3 per cent in value as compared with 1929. Canada supplied only 18.5 per cent of the total crude asbestos imported into the United States in 1930, as compared with 39.2 per cent in 1929. According to import classification, Canada supplied all the mill fiber imported in 1930 and virtually all in 1929; imports of this grade from Canada decreased 27.6 per cent in quantity and 31.8 per cent in value in 1930 as compared with 1929.

Asbestos (unmanufactured) exported from the United States, 1921–1930

Year	Short tons	Value	Year	Short tons	Value
1921	520	$101,600	1926	1,104	$85,922
1922	376	49,939	1927	309	48,774
1923	680	48,525	1928	850	346,632
1924	1,270	93,163	1929	709	108,467
1925	1,109	70,846	1930	771	95,318

Manufactured asbestos products exported from the United States, 1929 and 1930, by grades

Grade	1929		1930	
	Quantity	Value	Quantity	Value
Brake and clutch lining [1] ...linear feet [2]	7,426,622	$1,520,585	6,716,521	$1,372,068
Paper, millboard, and roll board ...short tons	850	152,168	959	153,232
Pipe covering and cement ...do	3,445	409,477	3,333	426,573
Textile yarn and packing ...do	990	1,031,578	892	949,116
Magnesia and manufactures ...do	3,130	391,628	3,422	454,408
Asbestos roofing ...squares	92,204	600,420	65,743	393,036
Other manufactures, except roofing ...short tons	2,446	534,743	2,389	445,077

[1] Classification for 1930 reads "Brake lining"; exports of clutch lining not separately recorded.
[2] Weight not recorded.

WORLD PRODUCTION

The total production of asbestos, by countries, from 1926 to 1930, in so far as figures are available, is shown in the following table:

World production of asbestos, 1926–1930, in metric tons

[Compiled by M. T. Latus, of the Bureau of Mines]

Country [1]	1926	1927	1928	1929	1930
Africa:					
Southern Rhodesia	30,249	30,097	36,251	38,677	34,260
Union of South Africa	12,789	20,085	21,821	29,970	17,491
Argentina [2]	38	1	----	----	(3)
Australia:					
New South Wales	5	----	----	----	----
South Australia	----	----	----	1	----
Western Australia	107	11	12	259	114
Canada [4]	253,469	249,273	247,690	277,647	219,641
China	(3)	241	(3)	(3)	(3)
Cyprus [5]	6,433	11,079	11,765	14,017	5,487
Finland	1,674	1,298	1,462	1,563	1,188
France	660	803	730	750	(3)
India, British	59	69	159	324	(3)
Italy	2,900	3,840	4,950	2,847	751
Japan [6]	1,000	1,000	1,000	1,000	1,000
Russia [7]	18,334	21,156	26,492	(3)	(3)
United States	1,232	2,704	2,031	2,862	3,848

[1] In addition to the countries listed, Bolivia, Brazil, and Madagascar are reported to produce small quantities of asbestos. Statistics of production are not available for Bolivia and Brazil, but exports reported are considerably less than a ton. Production in Madagascar is reported as follows: 1927, 23 kilograms; 1928, 108 kilograms; 1929, 545 kilograms.
[2] Rail and river shipments.
[3] Data not available.
[4] Exclusive of sand and gravel, the production of which is reported as follows: 1926, 14,217 tons; 1927, 18,398 tons; 1928, 20,672 tons; 1929, 17,215 tons; 1930, 36,568 tons.
[5] Exports.
[6] Approximate production.
[7] Year ended Sept. 30.

NOTES ON PRODUCTION IN FOREIGN COUNTRIES

CANADA

The Quebec asbestos industry suffered severe depression in 1930. The decline in tonnage of sales was 21 per cent as compared with 1929, and the decline in total value was 36 per cent. Many mines and mills were closed, while others operated on greatly reduced schedules. The average price per short ton dropped from $43.04 in 1929 to $34.65 in 1930.

Production figures in short tons for Quebec in 1930 are quoted in the following table from the Annual Report of the Quebec Bureau of Mines, Province of Quebec.

Production of asbestos in the Province of Quebec for 1930

Designation of grade	Shipments and sales		Average value per ton	Stocks on hand Dec. 31, 1930	
	Tons	Value		Tons	Value [1]
Crude No. 1	720	$345, 750	$480. 20	118	$56, 644
Crude No. 2	1, 440	411, 179	285. 54	1, 761	502, 631
Crude run of mine	161	10, 914	67. 79	192	13, 016
Spinning fiber	10, 411	1, 473, 522	141. 52	7, 433	1, 051, 911
Shingle fiber	19, 909	1, 406, 385	70. 64	14, 124	997, 721
Mill board and paper fibers	79, 738	2, 817, 295	35. 33	14, 964	528, 672
Fillers, floats, and other short fibers	129, 734	1, 925, 119	14. 84	17, 106	253, 849
Total	242, 113	8, 390, 164	34. 65	55, 698	3, 404, 444
By-products (sand and gravel)	40, 309	12, 413	. 31		
Total	282, 422	8, 402, 577			

[1] Values calculated at average price of each grade. These figures are given merely as a guide to approximate valuation of stocks on hand.

Quantity of rock mined during the year 1930, 4,901,206 tons.
Quantity of rock milled during the year 1930, 3,737,780 tons.

A small production of actinolite has been noted from Hastings and Addington Counties, Ontario. According to the Dominion Bureau of Statistics, shipments to the United States totaled 34 short tons, valued at $437, in 1930, as compared with 30 tons, valued at $375, in 1929.

AFRICA

Rhodesia.—Asbestos production in Rhodesia reached only 37,765 short tons in 1930 as compared with 42,634 tons in 1929, the year of peak production. Turner & Newall (Ltd.), operating the properties of the Rhodesian & General Asbestos Corporation (Ltd.), are the largest producers. With restricted output the profits of this company were naturally reduced, but a dividend of 11¼ per cent on the ordinary shares was declared. Chief production is from the Shabani mine, the largest asbestos mine in the world.

Rhodesian production over a period of 10 years is shown in the following table:

Asbestos produced in Rhodesia, 1921–1930

Year	Short tons	Value	Year	Short tons	Value
1921	19, 529	£795, 698	1926	33, 344	£726, 835
1922	14, 249	577, 699	1927	33, 176	794, 215
1923	20, 364	626, 880	1928	39, 960	970, 327
1924	26, 141	603, 423	1929	42, 634	1, 186, 627
1925	34, 349	766, 381	1930	37, 765	1, 070, 847

Union of South Africa.—From an exceptionally high tonnage in 1929 production in the Union of South Africa dropped more than 41 per cent in 1930. The greater decrease was in the Transvaal, which produced only about one-half as much as in the preceding year. Production was maintained at a much higher proportional level in the Cape Province than in the Transvaal, because the demand for blue fiber was better sustained than that for chrysotile.

The Cape Province supplies practically all the world's requirements of crocidolite or blue asbestos. The chief producers are the Cape Asbestos Co. (Ltd.) in the Prieska district and the Dominion Blue Asbestos Mines (Ltd.), controlled by Turner & Newall (Ltd.), in the Kuruman district.

Amosite is another peculiar variety of asbestos which is mined only in the Transvaal. It was produced in the Lydenburg district as early as 1914 and since 1927 has been obtained also in the Pietersburg district. In the latter area at least eight mines have been opened on occurrences extending for about 25 miles. Transportation is difficult, as the mines are 35 to 70 miles from a railroad. The fiber is long and adapted for certain types of products requiring spinning asbestos. It is well suited for 85 per cent magnesia pipe covering, laggings, packings, felted insulation, filter cloth, and asbestos-cement board and roofing shingles.

The following table gives production over a period of 10 years:

Asbestos produced in the Union of South Africa, 1921–1930

Year	Short tons				Total value
	Transvaal	Cape Province	Natal	Total	
1921	1,593	3,467	62	5,122	£103,067
1922	1,392	2,991	6	4,389	81,230
1923	4,076	4,317		8,393	121,453
1924	4,240	3,001		7,241	110,075
1925	7,628	2,540		10,168	152,115
1926	10,104	3,993		14,097	216,466
1927	17,313	4,827		22,140	343,301
1928	18,976	5,078		24,054	399,550
1929	26,984	6,030	23	33,037	497,393
1930	13,800	5,481		19,281	340,795

The relative importance of the different varieties produced is shown as follows:

Asbestos produced in the Union of South Africa, 1928–1930, by varieties

	1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value
Amosite (Transvaal)	6,748	£69,039	9,260	£98,241	3,281	£36,885
Chrysotile (Transvaal)	12,162	214,866	17,724	247,817	10,519	160,381
Chrysotile (Natal)			23	340		
Blue (Transvaal)	66	2,245				
Blue (Cape)	5,078	113,400	6,030	150,995	5,481	143,529
	24,054	399,550	33,037	497,393	19,281	340,795

OTHER COUNTRIES

Cyprus.—Although the production of short-fiber chrysotile in Cyprus increased markedly for a number of years, it fell off greatly in 1929 and 1930, as indicated in the following table:

Asbestos produced in and exported from Cyprus, 1925–1930 [1]

Year	Production (long tons)	Exports		Year	Production (long tons)	Exports	
		Long tons	Value			Long tons	Value
1925	3, 221	3, 290	£54, 639	1928	16, 287	11, 579	£231, 692
1926	6, 197	6, 331	121, 857	1929	14, 110	[2] 13, 796	[2] 292, 971
1927	11, 200	10, 904	207, 562	1930	7, 220	[2] 5, 400	[2] 116, 09

[1] Figures supplied by the Cyprus Trading Corporation (Ltd.) unless otherwise indicated.
[2] Figures reported by government of Cyprus.

Italy.—The output of Italian asbestos usually ranges from 2,000 to 5,000 tons a year, and increased production of gray asbestos from the Balangero mine is in prospect. Italian production in 1930 was reported as 751 metric tons. Italian fiber is used to a limited extent for spinning; it is also utilized in the fabrication of artificial stone, cartons, filters, papers, and cement-asbestos products. Italy is both an importer and exporter of asbestos. Imports in 1929 amounted to 6,220 long tons, because the domestic fiber was less suited to factory needs, and exports during the same year amounted to 2,860 long tons.

Russia.—Much has been written during the past year on Russian asbestos, but perhaps the most informative article is that published in the December, 1930, issue of Asbestos (see following bibliography). No official production figures for 1929 are yet available; however, estimates from different sources place the output at 46,000 to 56,000 metric tons, as compared with 26,492 tons in 1928 and 21,156 tons in 1927. No estimates for 1930 have been noted. Ultimate production under the 5-year plan is estimated by Knickerbocker in the Asbestos article previously referred to as five times 56,000 tons, or about 280,000 tons, a year. Kovaloff (see bibliography) estimates it at 90,000 tons a year. It is evident that a broad program of expansion is under way. Asbestos reserves are no doubt very extensive.

BIBLIOGRAPHY

The following publications on asbestos have recently appeared:

ASBESTOS. This Russian situation. Vol. 12, No. 6, 1930, pp. 4–14.

BRÜCKNER, H. The continental asbestos industry. India Rubber Jour. (internat. issue), Oct. 31, 1929, pp. 19–21.

HALL, A. L. Asbestos in the Union of South Africa. Union of South Africa Geol. Survey Mem. 12, 2d ed., 1930, 324 pp.

KEEP, F. E. Geology of the chromite and asbestos deposits of the Umvukwe Range, Lomagundi and Mazoe districts. Southern Rhodesia Geol. Survey Bull. 16, 1930, 105 pp.

——— The chrysotile asbestos deposits of Shabani, Southern Rhodesia. Third Empire Min. and Metal. Cong., South Africa Papers, 1930, 43 pp. Canadian Min. Jour., vol. 51, No. 36, 1930, pp. 865–869 (abridged).

KOVALOFF, P. Asbestos in Russia. Min. and Ind. Mag. of South Africa, vol. 11, No. 12, 1931, pp. 442–443.

KUPFERBERGER, W. Mining amosite asbestos in the Pietersburg district, South Africa. Eng. and Min. Jour., vol. 130, No. 11, 1930, pp. 571–574.

MARCUSE, B. Asbestos—"pierre à coton." Canadian Geog. Jour., vol. 1, No. 6, 1930, pp. 497–522.

PLUMB, H. The mining industry in the Mashaba district. Rhodesian Min. Jour., vol. 4, No. 41, 1930, pp. 513–515.

SLATE[1]

By Oliver Bowles and A. T. Coons

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CONDITIONS IN THE INDUSTRY

Slate sold by producers in the United States in 1930 was valued at $7,911,618, a decrease of 30 per cent from the value for 1929. The quantity of slate sold in 1930, approximately 463,610 short tons, represented a decrease of 31 per cent from 1929. More than 97 per cent of the slate produced is used in some form of construction, and the pronounced recession in building is definitely reflected in decreased demand for slate. The output in 1930 is the smallest in both quantity and value since 1921.

Sales of roofing slate in 1930 amounted to 340,140 squares, valued at $3,359,939, a decrease of 26 per cent in quantity and 32 per cent in value compared with 1929. The average value per square was $9.88 in 1930, $10.65 in 1929, and $11.20 in 1928.

Total sales of mill stock in 1930 amounted to 7,917,220 square feet valued at $2,755,530, a decrease of 20 per cent in quantity and 26 per cent in value from 1929. Decreases by uses are as follows: Electrical, 36 per cent in quantity and 38 per cent in value; structural and sanitary, 24 per cent in quantity and 25 per cent in value; vaults and covers, 32 per cent in quantity and 36 per cent in value; blackboards and bulletin boards, 13 per cent in quantity and 12 per cent in value; billiard-table tops, 11 per cent in quantity and 12 per cent in value; school slates—mostly exported—8 per cent in quantity and 6 per cent in value. Slate for walk ways, flagstones, crosswalks, stepping-stones, and similar uses had steadily increased in production the last few years prior to 1930, when there was a decrease of 28 per cent in quantity and 19 per cent in value from the output in 1929.

Sales of crushed slate in the form of granules and slate flour amounted to 289,700 short tons, valued at $1,695,417, in 1930—a decrease of 32 per cent in both quantity and value compared with 1929. The slate flour included in this total amounted to 34,630 tons, valued at $146,116, compared with 33,110 tons, valued at $176,413, in 1929. The total average value was $5.85 in 1930 and $5.82 in 1929. Other stone—"greenstone" (an altered diabase), "red rock," etc.—crushed into granules and sold in 1930 amounted to 117,510 short tons, valued at $727,264, as shown in the chapter of this series on Stone. Crushed slate in the form of granules used as surfacing material in manufactured roofing began competing with squares of solid slate about 1913 as one of the cheaper roofing substitutes. The largest output was in 1924; there has been a gradual decrease in production to 1930, when the output was the lowest since 1921. At present, except for local work, solid squares of roofing slate are used chiefly in higher-priced dwellings, whereas the manufactured material using granules as facing is employed in all classes of building construction. Such figures as are available regarding granule production are given in the table on page 282.

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[1] Work on manuscript completed August, 1931.

In 1930, 118 slate-quarrying companies reported sales, or 9 less than in 1929. In New York and Vermont many small quarries are worked intermittently on a small scale for roofing slate. The product of these quarries is generally sold with that of some of the larger quarries, and much of it consists of "freak" or odd-colored slate of unusual size or thickness for use in special work.

As slate from many of the small producers is sold by the larger producing companies the possibility of duplication of returns must be considered in the compilation of operators' reports. In preparing this report special care has been taken to avoid duplication.

COMPOSITION, ORIGIN, AND OCCURRENCE OF SLATE

In simple language, slate may be defined as a fine-grained rock that is derived from clays and shales and has a pronounced cleavage which permits it to be split readily into thin smooth sheets. Clays carried down by rivers gradually accumulate in thick beds on the ocean floor. Succeeding layers of sand, gravel, or limestone may be laid down over them, compressing them into compact shale beds. In later ages the mountain-building forces in the earth's crust may crumple and fold the shales under tremendous pressure and high temperature, which change the original clay into minerals, such as mica, quartz, and chlorite. Mica and chlorite occur in minute flakes, and pressure causes them to assume positions with their flat surfaces parallel, giving to slate the remarkable splitting property that is its most characteristic feature. Intense pressure consolidates the rock into a dense mass of great strength and exceedingly low porosity. Elevation of the sea floor and erosion of overlying rocks finally bring the slate beds into accessible positions.

Although rocks commonly termed slate—as, for example, the "bone" or slate associated with coal—are of common occurrence, slate of commercial quality appears only in relatively few localities. These localities are described in a later section of this report.

PHYSICAL PROPERTIES

High-grade slates such as are commonly sold have low absorption and high tensile strength. Colors are quite variable, those in Virginia, Pennsylvania, Maryland, and Maine ranging from light gray to blue black. The slates of New York and Vermont are chiefly red, green, purple, or variegated. Some slates retain their color for many years, whereas others change after exposure to the weather, although such a color change may not indicate deterioration. The color assumed on aging may, in fact, be more attractive than the original.

Slates are composed of very stable and enduring minerals, and there are numerous instances of high-grade slate roofs withstanding the weathering of centuries without noticeable deterioration. Slate of medium grades will serve in exposed places for 25 to 50 years, and the highest grades will far outlive most structures on which they are placed. It is recorded that slate quarried near Delta, Pa., in 1734 was used for roofing seven buildings in succession. In 1930 the seventh building was located and found to be a hog pen near Delta. A sample of this slate is now in an exhibit case at the Bureau of Mines in Washington, D. C. Although it was in use nearly 200 years it shows no evidence of deterioration or discoloration and appears to be quite capable of service for at least 200 years more.

STRUCTURAL FEATURES OF SLATE

The most noteworthy structural characteristic of slate, as mentioned previously, is its slaty cleavage. Slates usually possess a second direction of splitting less pronounced than the slaty cleavage; it is known as "sculp" or "grain" and is usually vertical and approximately at right angles to the slaty cleavage. The third direction, in which there is no tendency to split, is known as the "hard way." Another characteristic feature of some slates, notably those of Pennsylvania, is known as "ribbon"—dark bands crossing the slate surfaces. The ribbons represent variations in the original materials as they were laid down in successive beds. They mar the appearance of slate for certain uses, and some contain minerals that are less enduring than the clear stock.

USES

Originally slate was employed almost entirely for roofing; although this is still an important use, many others have been developed. Slate that is worked into slabs of various sizes and shapes is classed under the general term mill stock.

Mill products are of numerous kinds. Blackboards, bulletin boards, and school slates constitute one important branch. In the construction industries slate is widely used as steps, risers, baseboards, floor tile, mantels, window sills, lavatory slabs, wainscoting, and hearths. Various accessories include billiard and other table tops, sinks, laundry tubs, refrigerator shelves, greenhouse shelves, and flower boxes. The strength, endurance, and elasticity of slate adapt it remarkably well for grave vaults and for partitions and shelves in mausoleums.

The use of slate for ornamental flagging has recently become increasingly important. Slate with a honed finish and very close joints makes a beautiful floor. The variety of natural colors permits designs of floors in color patterns that vie in beauty with the most ornate rugs, and they have the added value of being fireproof, waterproof, and capable of withstanding continuous wear. Flagging may be used for interior floors, for paving yards, porches, courts, and flat roofs, or for ornamental walk ways. Two main styles are in general use. The "regular" style consists of rectangular flags of various sizes and colors fitted together with close joints; the "irregular" is made of random shapes and sizes that are necessarily less closely fitted and require well-cemented joints.

Various surface finishes are obtained by the so-called marbleizing process of repeated painting and baking. A more recent form of surface finish, known as "Struco," consists of spraying or printing the surface with a volatile lacquer. Very beautiful designs are possible for application to various forms of structural products, as well as to novelties such as clocks, inkwells, and paper weights.

Slate crushed to granular form is employed very widely in the manufacture of slate-surfaced composition roofing. Red, green, and blue-black or gray granules are manufactured from slates having these natural colors. Experiments are being conducted in artificial coloring for granules to provide material for the highly colored roofs demanded by many architects and home builders. The chief problem is to procure a fast color that will neither wash out nor fade. Slate in pulverized form, known as slate flour, is used as a filler in paints, road asphalt-surface mixtures, roofing mastic, and various other products.

STUDY OF PROPERTIES OF SLATE

A conviction is gaining ground that future growth of the slate industry depends to quite a degree on better classification of materials and more judicious choice of products to satisfy the demands of use. To this end considerable progress is being made toward more accurate determination of the properties of slate in their relation to use. The National Slate Association and committee D-16 on slate of the American Society for Testing Materials are sponsoring more accurate classification and more adequate specifications, the latter involving studies of properties and methods of tests. The United States Bureau of Standards and several college laboratories, notably those of Lafayette College, Lehigh University, Pennsylvania State College, and Rensselaer Polytechnic Institute, are collaborating in these studies. The Federal Specifications Board is taking active steps toward establishing a standard specification for roofing slate for Government use, and this also has demanded extensive testing by slate companies as well as by College and Government laboratories. Efforts thus directed are expected eventually to develop a mass of authoritative information that will enable slate producers to classify their materials more definitely and to direct each type to the use for which it is best adapted. Those who have at heart the best interests of the industry are convinced that excellent service under the most exacting requirements will enhance the salability of products.

MARKETING PROBLEMS

As may be noted from the table of slate production over a period of years, given on page 282, the industry made rapid strides for the four years following 1922, but for the past four years production has decreased appreciably. Lack of more consistent growth in the industry is due to various causes, but is to be attributed chiefly to the keen competition slate must meet in every line of production. Various types of roofing are advertised much more widely than slate, and many of them are synthetic products that can be manufactured at comparatively low cost. Similarly, numerous materials compete with slate in structural and electrical applications. For every use of slate some other material may be substituted. To approach more nearly the price levels of competing products efforts are being directed toward reducing the cost of quarrying and manufacture; noteworthy steps in this direction are the introduction of wire saws in quarries, manufacture of roofing slate from sawed blocks in mills, and wider use of mechanical equipment.

Another factor that retards effective marketing is lack of efficient selling and advertising agencies. There is, however, evidence of a movement toward bettering this condition through the establishment of joint marketing agencies in some localities to bring about better contacts between producers, distributors, and roofing and setting contractors, thus promoting sales and insuring better service to ultimate consumers. The big problem in all the slate regions is to find a market of sufficient extent to absorb the normal output of quarries. Marketing companies and associations are exerting a growing influence, particularly in Pennsylvania and Virginia. Sales organizations in Vermont and New York have been effective only in the marketing of structural slate and that used for floors, walks, and walls.

TECHNICAL PROGRESS

During recent years the slate industry has made long strides toward better technique in quarrying and manufacture. A notable example is the substitution in Pennsylvania of wire saws for channeling machines in making primary cuts in quarries. This equipment, introduced in 1926 by the Bureau of Mines in cooperation with the National Slate Association and some of the operators, has proved of great advantage in conserving slate, saving time, and reducing production costs. About 30 wire saws are now in use in slate quarries. The wire saw and its operation have been described in some detail in a recent bureau report.[2] Some interest has been shown in extending the use of the wire saw to cutting slate blocks in mills.

Notable advances in technology have been made during 1930, particularly in slate-finishing mills. A 48-inch diamond saw, used in the hard-vein slate of Pennsylvania to cut blocks for roofing-slate manufacture, cuts at a rate of 3 to 8 inches a minute on blocks 12 inches thick and eliminates much waste, mill production being increased 15 to 20 per cent with very little increase in tonnage of blocks entering the mill.

Through the use of drum sanders instead of rubbing-beds, there has been noteworthy advance in surface finishing in Maine. Coarse grits are used for rapid cutting and finer grits for finishing. A drum sander is several times faster than a rubbing-bed and may with further development replace planers.

The cost of abrasive sand is an important item of expense in slate-finishing mills. In ordinary practice much of it is carried away to waste before it is worn out. One company has introduced cone classifiers to recover for further use sand that is not worn out, thereby effecting a substantial saving.

PRODUCTION

The following tables show sales of slate, by uses, from 1921 to 1930. The total quantity and value given for each use are the totals of the reports of the quarrymen (not the selling agents), and the value is that f. o. b. quarry or nearest point of shipment. It should be borne in mind that some of the mill stock may ultimately be used for purposes other than those reported by the quarrymen.

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[2] Bowles, Oliver, The Wire Saw in Slate Quarrying: Tech. Paper 469, Bureau of Mines, 1930, 31 pp.

Slate sold by producers in the United States, 1921–1930, by uses

[Value is at point of shipment]

Year	Roofing slate		Mill stock		Other uses [1] (value)	Total	
	Squares (100 square feet)	Value	Square feet	Value		Short tons (approximate)	Value
1921	348, 085	$3, 197, 745	8, 970, 000	$2, 719, 723	$1, 404, 538	411, 500	$7, 322, 006
1922	479, 243	4, 069, 761	9, 276, 800	2, 899, 195	2, 207, 828	607, 680	9, 176, 784
1923	507, 587	4, 582, 535	11, 109, 480	4, 159, 644	3, 334, 445	707, 100	12, 076, 624
1924	469, 393	4, 626, 614	10, 009, 180	3, 922, 366	3, 227, 036	727, 700	11, 776, 016
1925	494, 530	5, 084, 945	11, 077, 860	4, 231, 477	3, 258, 904	724, 600	12, 575, 326
1926	465, 900	5, 079, 087	10, 278, 130	4, 191, 185	3, 082, 495	718, 000	12, 352, 767
1927	468, 560	4, 949, 940	9, 287, 680	3, 519, 386	2, 911, 410	692, 040	11, 380, 736
1928	483, 280	5, 411, 332	9, 220, 170	3, 408, 304	2, 652, 655	646, 360	11, 472, 291
1929	462, 120	4, 920, 766	9, 936, 480	3, 702, 145	2, 622, 267	670, 070	11, 245, 178
1930	340, 140	3, 359, 939	7, 917, 220	2, 755, 530	1, 796, 149	463, 610	7, 911, 618

[1] Chiefly slate granules.

In approximating the tonnage for the various slate products given in the table that follows, a specific gravity of 2.75 has been used as the basis of calculation, and thicknesses used range from three-sixteenths inch to 2 inches to correspond to the averages for the several products. Calculations are made on the individual lots reported by each producer. The thickness of individual roofing slates sold—especially in New York and Vermont—has increased greatly in the last few years, owing to the demand for better roofs and for architectural effects. The weight of a square of slate as reported by the quarrymen ranged from 670 to 2,000 pounds.

Roofing slate, mill stock,[1] and slate granules (including slate "flour") sold by producers in the United States, 1929 and 1930, by uses

Use	1929		1930	
	Quantity	Value	Quantity	Value
Roofing .... squares	462, 120	$4, 920, 766	340, 140	$3, 359, 939
Approximate equivalent in short tons	178, 500		127, 080	
Electrical .... square feet	1, 461, 110	1, 153, 396	928, 760	711, 578
Approximate equivalent in short tons	12, 580		7, 690	
Structural and sanitary .... square feet	3, 286, 550	1, 287, 150	2, 498, 340	960, 190
Approximate equivalent in short tons	24, 730		19, 190	
Grave vaults and covers .... square feet	515, 450	133, 031	350, 440	85, 047
Approximate equivalent in short tons	4, 700		3, 290	
Blackboards and bulletin boards .... square feet	3, 562, 360	1, 042, 771	3, 092, 880	921, 735
Approximate equivalent in short tons	9, 280		7, 830	
Billiard-table tops .... square feet	161, 470	65, 426	143, 440	57, 750
Approximate equivalent in short tons	1, 390		1, 270	
School slates .... pieces	1, 843, 000	20, 371	1, 688, 540	19, 230
Approximate equivalent in square feet	949, 540		903, 360	
Approximate equivalent in short tons	1, 030		850	
Flagstones, walk ways, etc .... square feet	1, 248, 190	124, 524	895, 230	100, 732
Approximate equivalent in short tons	8, 920		6, 710	
Granules and "flour" .... short tons	428, 940	2, 497, 743	289, 700	1, 695, 417
Total (quantities approximate, in short tons)	670, 070	11, 245, 178	463, 610	7, 911, 618

[1] Mill stock sold, including school slates, was as follows: 1929, 9,936,480 square feet, valued at $3,702,145; 1930, 7,917,220 square feet, valued at $2,755,530.

Slate sold by producers in the United States, 1929 and 1930, by States and uses

State	Operators	Roofing		Mill stock		Other uses (value)[1]	Total value
		Squares (100 square feet)	Value	Square feet	Value		
1929							
Arkansas	1					(2)	(2)
California	2					(2)	(2)
Georgia	1					(2)	(2)
Maine	2	3,720	$38,316	702,740	$613,996	$1,315	$653,627
Maryland	3	(2)	(2)			(2)	214,770
New Jersey	1	(2)	(2)				(2)
New York	22	14,670	204,362			634,169	838,531
Pennsylvania	38	251,880	1,967,428	8,011,080	2,473,838	356,934	4,798,200
Vermont	51	151,810	2,214,869	1,222,660	614,311	875,714	3,704,894
Virginia	6	35,460	434,628			(2)	(2)
Undistributed [3]		4,580	61,163			754,135	1,035,156
	127	462,120	4,920,766	9,936,480	3,702,145	2,622,267	11,245,178
1930							
Arkansas	1					(2)	(2)
California	3					41,377	41,377
Georgia	1					(2)	(2)
Maine	3	5,130	50,908	540,500	455,414		506,322
Maryland	2	(2)	(2)				(2)
New Jersey	1	(2)	(2)				(2)
New York	15	3,740	54,316	10,000	5,191	379,112	438,619
Pennsylvania	36	194,700	1,470,669	6,675,050	1,918,752	244,837	3,634,258
Vermont	51	108,580	1,433,384	691,670	376,173	653,684	2,463,241
Virginia	5	24,040	303,335			(2)	(2)
Undistributed [3]		3,950	47,327			477,139	827,801
	118	340,140	3,359,939	7,917,220	2,755,530	1,796,149	7,911,618

[1] For details see table of general sales on p. 282 and table on p. 288 for Pennsylvania.
[2] Included under "Undistributed".
[3] Includes output of States entered as (2) above.

Crushed slate (granules and flour) sold by producers in the United States, 1918–1930

Year	Short tons	Value	Year	Short tons	Value
1918	280,000	$802,350	1925	497,700	$3,210,904
1919	202,611	1,155,140	1926	498,050	3,009,368
1920	268,516	2,044,942	1927	459,760	2,775,962
1921	231,770	1,397,886	1928	413,980	2,468,471
1922	379,980	2,177,061	1929	428,940	2,497,743
1923	462,260	3,268,554	1930	289,700	1,695,417
1924	512,810	3,178,454			

TARIFF

Prior to 1913 the duty on imported slates, chimney pieces, mantels, slabs for tables, roofing slates, and all other manufactures of slate, was 20 per cent ad valorem. The act of October, 1913, reduced it to 10 per cent ad valorem; that of September, 1922, raised it to 15 per cent ad valorem; and the act of 1930 raised it to 25 per cent ad valorem.

IMPORTS AND EXPORTS [3]

The value of the slate imported for consumption in the United States in 1930 decreased 49 per cent as compared with 1929. Exports are shown for roofing slate only, except such information as is obtained by the Bureau of Mines from shippers and given in the table on page 285. There was a decrease of 49 per cent in the quantity and 47 per cent in the value of roofing slate exported in 1930, as compared with 1929.

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[3] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce, except as otherwise indicated.

The imports and exports of slate for a series of years are shown in the following tables:

Value of slate imported for consumption in the United States, 1921–1930

1921	$2,923	1926	$86,681
1922	2,753	1927	78,909
1923	16,881	1928	44,778
1924	32,095	1929	95,073
1925	64,570	1930	48,065

Value of slate imported into the United States, 1926–1930, by countries [1]

[General imports]

Country	1926	1927	1928	1929	1930
Austria	--------	--------	$5	--------	--------
Belgium	$297	$282	1,067	$1,468	$307
Canada	21	5	1,517	--------	--------
China	68	7	--------	15	4
Czechoslovakia	16	3	40	187	445
France	29,465	9,450	11,563	11,748	6,274
Germany	9,201	323	107	453	--------
Gibraltar	--------	--------	30	--------	--------
Hong Kong	10	51	15	11	29
Italy	43,797	30,069	16,910	37,099	28,040
Japan	113	178	73	433	199
Netherlands	3	--------	--------	16,489	--------
Norway	506	2,040	1,201	6,995	5,612
Portugal	6,100	9,029	9,076	22,638	1,804
Spain	857	--------	--------	1,171	858
Sweden	--------	--------	--------	954	--------
Switzerland	--------	1,580	--------	--------	--------
United Kingdom	3,143	21,029	2,738	2,866	3,255
	93,597	74,046	44,342	102,527	46,827

[1] Quantity not recorded.

About 17 per cent of the total value of the slate imported in 1930 was represented by roofing slate, of which more than 75 per cent was the value of slates from France; other roofing slate was imported from Norway and the United Kingdom. Somewhat more than one-half the total value of imports was for slate in the form of slabs, the uses of which are not known; this slate comes chiefly from Italy but also from the United Kingdom, Portugal, Spain, Czechoslovakia, and Norway. Some blackboard and school-slate material was imported from Italy, and slate for billiard-table tops was imported from Belgium. A small part of the total value of the imports was made up of tiles, plaques, and unspecified products. No granules were noted among the imported materials. To determine the exact nature of the slate imported is difficult on account of indefinite classification. The countries given in the foregoing table represent the shipping points and do not necessarily indicate the origin of the product.

Roofing slate exported from the United States, 1921–1930

Year	Number of squares	Value	Year	Number of squares	Value
1921	(1)	$101,630	1926	5,621	$53,117
1922	11,040	97,811	1927	6,798	80,171
1923	8,462	78,780	1928	12,236	119,187
1924	8,165	77,422	1929	10,376	121,367
1925	5,785	54,130	1930	5,278	64,343

[1] Quantity not recorded.

Roofing slate exported from the United States, 1928–1930, by countries

Country	1928		1929		1930	
	Number of squares	Value	Number of squares	Value	Number of squares	Value
Australia					137	$1,000
Canada	6,642	$79,952	8,277	$102,053	4,010	54,069
Colombia			36	174		
Mexico	85	300	77	352	79	475
New Zealand			148	2,318	256	2,175
Panama	154	1,330	5	25	7	53
Philippine Islands	126	172			60	899
United Kingdom	4,879	34,477	1,372	11,470	605	4,362
West Indies:						
British—						
Bermudas			5	25		
Trinidad and Tobago	222	1,440	196	1,767	66	648
Other	38	800	49	250		
Cuba	74	659	20	134	47	479
Dominican Republic					2	30
Haiti			191	2,799		
Netherland					9	153
Virgin Islands of the United States	16	57				
	12,236	119,187	10,376	121,367	5,278	64,343

The following figures for exports of slate other than roofing slate were collected by the Bureau of Mines from shippers of the products named. Of the slate reported in this table all the blackboard and bulletin-board material was shipped to Canada, as was more than 87 per cent of the structural slate, more than 60 per cent of the electrical slate, and practically all of the granules. Small amounts of school slates were shipped to India, Netherland East Indies, Canada, Australia, New Zealand, Holland, Africa, and other countries. Slate for electrical use in switchboard panels, bases, etc., was distributed more widely than any other product; after Canada, South America furnished the chief market, with smaller shipments to Russia, Mexico, Cuba, Spain, Central America, and other countries. Slate for billiard-table tops was shipped chiefly to Mexico, but also to Central America, Philippine Islands, Cuba, and Canada. Small shipments of granules to England, Germany, and Holland were recorded.

Slate other than roofing exported from the United States, 1928–1930, by uses

Use	1928		1929		1930	
	Quantity	Value	Quantity	Value	Quantity	Value
School slates ... cases [1]	14,320	$81,075	19,570	$108,135	16,280	$95,935
Electrical slate ... square feet	23,190	19,102	16,720	18,037	18,830	20,406
Blackboards ... do	160,680	63,526	188,720	74,610	177,760	59,810
Billiard tables ... do	65,620	45,010	20,150	34,455	15,760	9,802
Structural ... do	14,440	7,741	18,390	15,882	12,670	5,280
Slate granules and "flour" ... short tons	13,990	82,140	14,250	84,185	27,540	162,000
		298,594		335,304		353,233

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[1] Cases weigh from 130 to 165 pounds each; average is 135 pounds.

REVIEW BY DISTRICTS

The active slate-producing districts of the United States are the Monson district of Maine; the New York-Vermont district, including Washington County, N. Y., and Rutland County, Vt.; the Lehigh district, including Lehigh and Northampton Counties, Pa., and Sussex County, N. J.; the Peach Bottom district, including York County, Pa., and Harford County, Md.; and the Buckingham County (Arvonia) and Albemarle County districts of Virginia. These districts produce roofing slate and mill stock; some of them also produce roofing granules and slate flour. Roofing granules and flour were also produced in California and Georgia in 1930. A small amount of slate was taken out in Arkansas for assessment work.

Maine.—Slate produced in the Maine district is sold chiefly for electrical work, with lesser amounts for roofing and for structural purposes. The quantity and value of roofing slate sold in 1930 increased compared with 1929, and sales of electrical slate decreased. The producing companies in 1930 were The Monson Maine Slate Co. (address, Monson, Me.), the Portland-Monson Slate Co. (address, 25 Central Wharf, Portland, Me.), and the Rising & Nelson Slate Co. (address, West Pawlet, Vt.), each with quarries at Monson.

New York-Vermont.—The New York slate district adjoins that of Vermont, so it is sometimes difficult to determine from the reports of the producers to which State the product should be credited. These two States produce all of the colored slates used for roofing. Red slate is the chief product of the New York quarries; they also produce, with those of Vermont, various green, purple, variegated, mottled, and "freak" slates in demand for roofs.

The output of the New York quarries is for granules (red), roofing slate, and slabs for walk ways, flagging, etc. The principal producers of granules are the Advance Industrial Supply Co. (address, 111 West Washington Boulevard, Chicago, Ill.) and the J. B. Preston Co. (Inc.) (address, 122 East Forty-second Street, New York City), Granville; the Staso Milling Co. (address, 332 South Michigan Avenue, Chicago, Ill.), Hampton; and the Sheldon Slate Products Co., Middle Granville. The Advance Industrial Supply Co. and the Sheldon Slate Products Co. also produced roofing slate. Other roofing-slate producers in New York are John Ritchie and Schubert Bros., Granville; Wm. Darius, Jones & Hopkins (address, Whitehall), McDonough Slate Co., and McGrath Bros., Middle Granville; and others who operate quarries intermittently and sell their product through dealers or other quarry operators. The chief producers of flagging, walk ways, etc., are Jones & Hopkins, McDonough Slate Co., and the Sheldon Slate Products Co., with addresses as given above, and Earl & Ritchie (address, Fair Haven, Vt.), Whitehall. Demand and prices for 1930 were reported by all operators as less than in 1929.

The Vermont quarries produce roofing slate, mill stock, granules, and slate for walks, etc. The colors are in wide variety and combinations of green and purple and are generally classed as green, unfading green, unfading mottled green and purple, weathering green (sea green), purple, variegated, and "freak." There are also black and gray varieties. Most of the granules manufactured are green. Much of the roofing slate produced in Vermont is, as in New York, quarried and shaped by owners of small quarries that are worked at irregular intervals. This slate is generally of unusual color and specially sized and is sold through operators of large quarries or through dealers. On account of the variety of colored slates found in this district much of the roofing slate commands a high price. There was a decrease of 28 per cent in quantity and 35 per cent in value of roofing slate reported sold in Vermont in 1930 as compared with 1929. Mill stock used in structural and sanitary work, for electrical purposes, and in billiard-table tops is also produced in Vermont. There was a decrease in 1930 of 43 per cent in quantity and 39 per cent in value in mill stock for these purposes as compared with 1929.

Roofing and mill slate is produced in Vermont chiefly by the following firms, many small producers being omitted.

Castleton: The John Jones Slate Co.; mill stock.
Castleton and Poultney: The Penrhyn Slate Co. of Vermont (address, Hydeville); roofing, mill stock.
Fair Haven:
  S. Allen's Sons; roofing, mill stock.
  C. R. Beach; roofing.
  Harvey Bush Slate Co.; roofing.
  Clark-Flanagan (Inc.); roofing, mill stock.
  Durick, Keenan & Co. (Inc.); mill stock.
  Fair Haven Marble & Marbleized Slate Co.; roofing, mill stock.
  Hinchey Consolidated Slate Co. (Inc.) (address, Hydeville); roofing, mill stock.
  Hydeville Slate Works (address, Hydeville); mill stock.
  W. H. Pelkey; roofing, mill stock.
  Sbardella & Pedro Bros. Slate Co. (address, Poultney); roofing.
Pawlet:
  O'Brien Bros. Slate Co. (Inc.) (address, Granville, N. Y.); roofing.
  Ondawa Slate Co. (address, Granville, N. Y.); roofing.
  Owen W. Owens & Sons (Inc.) (address, Granville, N. Y.); roofing.
  Roberts, Jones & Williams (address, Granville, N. Y.); roofing.
  H. G. Williams Slate Co. (address, Granville, N. Y.); roofing.
Pawlet, Poultney, and Rupert: F. C. Sheldon Slate Co. (address, Granville, N. Y.); roofing.
Pawlet and Wells: Norton Bros. (address, Granville, N. Y.); roofing.
Poultney:
  The Auld & Conger Co. (address, 1920 East Seventy-fifth Street, Cleveland, Ohio); Bush quarries; roofing. Quarries not operated in 1930; sales made from stock.
  Cambrian Slate Co. (address, Granville, N. Y.); roofing.
  El Nido Slate Co.; roofing.
  The John D. Emack Co. (address, 1700 Sansom Street, Philadelphia, Pa.); roofing.
  McCarty Slate Co. (Inc.); roofing.
  Mahar Bros. Slate Co. (Inc.) (address, Fair Haven); roofing, mill stock.
  Mammoth Slate Co.; roofing, mill stock.
  Montvert Slate Co.; roofing.
  New England Slate Co.; roofing.
  Andrew Panda; roofing.
  Red Morris Slate Co.; roofing.
Poultney and West Pawlet: Rising & Nelson Slate Co. (address, West Pawlet); roofing.
Wells:
  Evergreen Slate Co. (address, Granville, N. Y.); roofing.
  R. Brereton Jones Slate Co. (address, Granville, N. Y.); roofing.
  Mettowee Valley Slate Co. (address, Granville, N. Y.); roofing.
  Wm. Morris & Son (address, Granville, N. Y.); roofing.
  Williams Bros. (address, Middle Granville, N. Y.); roofing.
West Pawlet:
  Edwards Bros.; roofing.
  Hughes & Edwards; roofing.
  Jones & Roberts; roofing.
  Patrick Kehoe; roofing.
  Griffith T. Roberts Estate; roofing.

Nearly all of the firms in Vermont that produce mill stock also sell slabs for flagstones, stepping-stones, etc. Vermont produces the greater part of this class of slate. Slate granules and slate flour are produced at Castleton by the Staso Milling Co. (address, 332 South Michigan Avenue, Chicago, Ill.).

Maryland-Pennsylvania.—Production in the Peach Bottom district in Maryland and Pennsylvania was confined to roofing slate and granules in Harford County, Md., and granules in York County, Pa.

Slate for roofing was quarried in Maryland in 1930 at Cardiff, Harford County, by the Peach Bottom Slate Co. of Harford County (address, Delta, Pa.). The Staso Milling Co. (address, 332 South Michigan Avenue, Chicago, Ill.) operates a plant for the production of slate granules and flour at Whiteford, Harford County.

The granules from York County, Pa., were produced by The Funkhouser Co. (address, Hagerstown, Md.), near Delta.

Pennsylvania is the largest producer of slate (exclusive of slate granules) in the United States and also produces a greater variety of slate products than any other State, although Maine and Vermont both outrank it in the output of electrical slate. The total value of slate sold in Pennsylvania by producers was 24 per cent less in 1930 than in 1929. Roofing slate decreased 23 per cent in quantity and 25 per cent in value in 1930 as compared with 1929, and total mill stock (6,675,050 square feet, valued at $1,918,752) decreased 17 per cent in quantity and 22 per cent in value.

Sales of slate by producers in Pennsylvania, by counties and uses, in 1930 were as follows:

Slate sold by producers in Pennsylvania in 1930, by counties and uses

County	Operators	Roofing slate		Mill stock [1]			
				Structural and sanitary [2]		Electrical	
		Squares (100 square feet)	Value	Square feet	Value	Square feet	Value
Lehigh	8	15,360	$99,933	42,110	$13,321	138,700	$64,578
Northampton and York [3]	28	179,340	1,370,736	2,316,040	809,070	41,770	34,999
	36	194,700	1,470,669	2,358,150	822,391	180,470	99,577
Total, 1929	38	251,880	1,967,428	3,012,500	1,135,695	340,530	219,761

County	Mill stock—Continued				Other (value) [4]	Total value
	Blackboards and bulletin boards		School slates			
	Square feet	Value	Square feet	Value		
Lehigh	690,910	$132,758	903,360	$19,230	$300	$330,120
Northampton and York [3]	2,401,970	788,977			300,356	3,304,138
	3,092,880	921,735	903,360	19,230	300,656	3,634,258
Total, 1929	3,562,360	1,042,771	949,540	20,371	412,174	4,798,200

[1] Exclusive of billiard-table material, value for which is included under "Other."

[2] Includes slate for grave covers and vaults.

[3] York County produced roofing granules and "flour" only.

[4] In 1929 includes 146,150 square feet of billiard-table material, valued at $55,240, and 58,490 tons of granules and "flour," valued at $352,402; in 1930 includes 140,190 square feet of billiard-table material, valued at $55,819.

The principal slate-quarry operators in Pennsylvania and the classes of slate produced by them are as follows:

The Lehigh district, which includes Lehigh and Northampton Counties, now produces all of the roofing slate and all of the mill stock sold in the State.

Lehigh County: All the slate companies operating in Lehigh County produce both roofing and mill stock. The quarries are in the vicinity of Emerald, Slatedale, and Slatington. The producing companies in 1930 and their addresses were as follows: J. P. Kern Slate Co. and Shenton Slate Co., Slatedale; American Slate Quarries, Blue Mountain Slate Manufacturing Co., Blue Ridge Quarries (Inc.), Cambridge Slate Co., Manhattan Slate Co., and Slatington Slate Co., Slatington.

Northampton County: The quarry operators in Northampton County and their product in 1930 were as follows:

Bangor:
    Bangor Ideal Slate Mining Co.; roofing.
    Bangor Quarry Co. (address, 1920 East Seventy-fifth Street, Cleveland, Ohio); Bangor Union quarry; roofing, mill stock.
    Bangorvein Slate Co.; Bangor Peerless quarry; roofing, mill stock.
    Columbia Bangor Slate Co.; roofing.
    North Bangor Slate Co.; roofing, mill stock.
    Old Bangor Slate Co.; roofing.
    Slate Products Co. (Inc.); roofing, mill stock.
Berlinsville: Amalgamated Slate Quarries Co. (address, Easton); Genuine Washington quarries; roofing, mill stock.
Chapman Quarries: Chapman Slate Co. (address, Bethlehem); roofing.
East Bangor: East Bangor Consolidated Slate Co.; roofing, mill stock.
Edelman: The Hard-Vein Slate Co. (address, Easton); roofing.
Nazareth: Edelman Standard Hard-Vein Slate Co. (address Edelman); roofing.
Pen Argyl:
    Albion Vein Slate Co. (address, Bangor); roofing.
    Belmont Slate Co. (address, Bangor); roofing, mill stock.
    Diamond Slate Co. (Inc.); mill stock.
    Doney Slate Co. (Inc.); roofing, mill stock.
    Jackson-Bangor Slate Co.; roofing, mill stock.
    Keenan Structural Slate Co.; Albion quarry; roofing, mill stock.
    Parsons Bros. Slate Co.; roofing, mill stock.
    Parsons Manufacturing Co.; slate "flour."
    Stephens-Jackson Co.; Courtney quarry; roofing, mill stock.
    D. Stoddard & Son (address, Bangor); Albion Vein quarry; mill stock.
West Bangor: Bangor Fidelity Slate Co. (address, Bangor); roofing, mill stock.
Windgap:
    Bolger-Heller Slate Co.; roofing, mill stock.
    Colonial Slate Co. (address, Bangor); roofing, mill stock.
    Imperial Slate Blackboard Co.; roofing, mill stock.
    Phoenix Slate Co.; roofing, mill stock.

Virginia.—Slate was quarried in Virginia in 1930 by the following companies:

Albemarle County:
    Esmont—Blue Ridge Slate Corporation (address, Charlottesville); Flint Arrow quarry; roofing, granules.
    Monticello—Monticello Slate Corporation (address, care of Williams-Arvonia Slate Corporation, Richmond); roofing.
Buckingham County:
    Arvonia—
        Arvonia-Buckingham Slate Co. (Inc.) (address, Richmond); roofing.
        Williams Slate Co. (Inc.); Big Quarry; roofing.
    Ore Bank—Le Sueur-Richmond Slate Corporation; roofing.

Other States.—A small amount of slate used for flagging or walk ways was taken from the slate deposits near Norman, Montgomery County, Ark., operated by E. C. Bird of Little Rock. The slate was taken out for assessment work, and demand for the material was reported as good; distance of haul to market is said to curtail more active development of the quarries.

In 1930 The Pacific Minerals Co. (Ltd.) (address, Richmond) operated the Chili Bar slate quarry at Placerville, Eldorado County, Calif., for slate granules; John L. Witney (Inc.), Jamestown, and W. S. McLean, San Francisco, quarried slate in Tuolumne County for roofing granules.

Slate granules (green) and ground slate for use as a fertilizer filler were produced at Fair Mount, Ga., in 1930 by The Funkhouser Co. (address, Hagerstown, Md.).

The slate quarries near La Fayette, Sussex County, N. J., are operated in beds that are geologically and geographically continuous with the slate beds in Lehigh and Northampton Counties, Pa. These quarries were operated in 1930 for roofing slate by the Lafayette Slate Mining Corporation (address, Port Chester, N. Y.).

BARITE AND BARIUM PRODUCTS[1]

By R. M. Santmyers and B. H. Stoddard[2]

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INTRODUCTION

The sales of barite in several States—Missouri, Nevada, South Carolina, and Virginia—increased in 1930, but not enough to offset the sharp drop in the quantity of Georgia mineral sold or used by producers.

The average value per ton of crude barite as reported by producers decreased slightly as compared with 1929 (from $6.67 to $6.55), but this decrease was not reflected in the prices of several of the leading barium products. Ground barite in particular was in greater demand than during the previous year and sold at a substantially higher price.

CRUDE BARITE

PRODUCTION

The mine production of crude barite in the United States in 1930 was 237,505 short tons, a decrease of 38,440 tons (14 per cent) from the preceding year. Missouri was the leading producer of this mineral in 1930, with an output of 139,889 tons—59 per cent of the total production in the United States—the highest figure ever recorded by the State. Georgia, with an output of 43,258 tons in 1930, showed a decrease of 45,678 tons (51 per cent) from 1929. Other important producing States are California, Tennessee, and Virginia; the first two, however, registered decreases in output as compared with 1929. Nevada, with several new mines in operation in 1930, increased its output 224 per cent, or from 818 tons in 1929 to 2,647 tons in 1930.

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[1] Work on manuscript completed September, 1931.

[2] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Crude barite mined in the United States, 1927–1930, by States, in short tons

State	1927	1928	1929	1930
California	14,069	11,881	24,801	19,545
Georgia	92,973	107,796	88,936	43,258
Missouri	83,115	112,715	119,771	139,889
Nevada	454		818	2,647
Tennessee	12,722	19,492	26,140	16,821
Virginia	10,861	7,877	15,479	10,250
Other States [1]				5,095
	214,194	259,761	275,945	237,505

[1] South Carolina and Wisconsin.

SALES

The crude barite sold or used by producers in the United States during 1930 was 234,932 short tons, valued at $1,538,171, as compared with 277,269 tons, valued at $1,850,706, in 1929, a decrease of 15 per cent in quantity and 17 per cent in value. The average value per ton, f. o. b. mine, likewise decreased—from $6.67 in 1929 to $6.55 in 1930 (2 per cent).

Total sales of barite from Missouri, Nevada, South Carolina, and Virginia increased as compared with 1929. Missouri's sales (132,640 tons) increased 12 per cent in quantity and 7 per cent in value over 1929 and constituted 56.5 per cent of the entire quantity sold in the United States in 1930.

In Nevada, after the Eagleville deposit in Mineral County was opened up, the sales of crude barite increased from 818 tons, valued at $6,384, in 1929 to 2,647 tons, valued at $19,457, in 1930. If sufficient demand develops the output from this State may be increased further, as another large deposit is reported to have started production at the end of the year.

South Carolina's sales more than doubled in 1930, and sales of barite in Virginia increased substantially in both quantity and value as compared with the preceding year.

The quantity of crude barite from Georgia that was sold or used by producers fell to an extremely low level during 1930. With the exception of the postwar depression year 1921, the sales of crude barite in Georgia in 1930 (41,746 tons, valued at $230,769) were the lowest recorded since 1915, when sales amounted to 31,027 tons, valued at $102,825.

Crude barite sold or used by producers in the United States, 1921–1930

Year	Short tons	Value f. o. b. at mine		Year	Short tons	Value f. o. b. at mine	
		Total	Average			Total	Average
1921	66,369	$531,958	$8.02	1926	237,875	$1,773,293	$7.45
1922	155,040	1,123,950	7.25	1927	254,265	1,670,878	6.57
1923	214,183	1,664,156	7.77	1928	269,544	1,754,924	6.51
1924	196,332	1,540,744	7.85	1929	277,269	1,850,706	6.67
1925	228,063	1,703,097	7.47	1930	234,932	1,538,171	6.55

Crude barite sold or used by producers in the United States, 1929 and 1930, by States

State	1929				1930			
	Short tons	Percentage of total	Value f. o. b. at mine		Short tons	Percentage of total	Value f. o. b. at mine	
			Total	Average			Total	Average
California	24,701	8.9	$147,762	$5.98	19,517	8.3	$114,310	$5.86
Georgia	94,118	34.0	546,212	5.80	41,746	17.8	230,769	5.53
Missouri	118,679	42.8	880,319	7.42	132,640	56.5	938,812	7.08
Nevada	818	.3	6,384	7.80	2,647	1.1	19,457	7.35
Tennessee	26,140	9.4	181,725	6.95	17,006	7.2	111,981	6.58
Virginia	12,813	4.6	88,304	6.89	10,250	4.4	73,168	7.14
Other States [1]					11,126	4.7	49,674	4.46
	277,269	100.0	1,850,706	6.67	234,932	100.0	1,538,171	6.55

[1] South Carolina and Wisconsin.

STOCKS AT MINES

The apparent stocks of crude barite on hand at mines at the end of December, 1930, were about 44,200 short tons, of which about 1,500 tons were held in Georgia, 37,700 tons in Missouri, and 5,000 tons in Nevada. These stocks do not include the crude barite held at chemical, lithopone, and grinders' plants, as such lots are considered marketed product.

CONSUMPTION BY USES

During 1930 the barite-consuming industries of the United States used 325,195 short tons of domestic and imported barite as compared with 334,406 tons in 1929, a decrease of 3 per cent. This barite was apportioned as follows: For the manufacture of ground barite, 69,426 tons in 1930 as compared with 58,770 tons in 1929, an increase of 18 per cent; for lithopone, 178,944 tons, a decrease of 20 per cent from a total of 223,188 tons in 1929; and for barium chemicals, 76,825 tons as compared with 52,448 tons in 1929, an increase of 46 per cent.

Twenty-six plants in 12 States accounted for the consumption of barite during 1930, as compared with 27 plants in the same States in 1929. As reported to the Bureau of Mines, California had one plant less in operation in 1930 than in 1929. Illinois, with six plants, used about 60,300 tons of domestic and imported crude barite in 1930 in the manufacture of lithopone and barium chemicals, as compared with approximately 76,700 tons in 1929, a decrease of 21 per cent. Missouri, with four plants, consumed about 80,200 tons for the manufacture of ground barite and barium chemicals as compared with about 67,900 tons in 1929, an increase of 18 per cent.

Pennsylvania, with two plants, consumed about 46,300 tons of barite in the manufacture of lithopone and chemicals in 1930, a decrease of 15 per cent as compared with the preceding year. New Jersey, with three plants, decreased its consumption of barite for lithopone and barium chemical manufacture from about 55,700 tons in 1929 to about 40,600 tons in 1930, or 27 per cent. California, with one plant less in operation in 1930 than in 1929, consumed about 35,800 tons for the manufacture of ground barite, lithopone, and barium chemicals as compared with about 17,500 tons in 1929, an increase of 105 per cent.

All the imported crude barite used for the manufacture of barium products was consumed in the Atlantic Coast States.

Crude barite (both domestic and imported) used in the manufacture of barium products in the United States, 1921–1930, in short tons

Year	In manufacture of—			Total	Year	In manufacture of—			Total
	Ground barite	Lithopone	Barium chemicals			Ground barite	Lithopone	Barium chemicals	
1921	28,296	61,359	10,952	100,607	1926	69,048	178,889	33,119	281,056
1922	48,280	94,259	25,303	167,842	1927	73,119	222,791	34,280	330,190
1923	47,713	128,547	34,327	210,587	1928	74,814	211,592	48,289	334,695
1924	42,855	137,127	33,181	213,163	1929	58,770	223,188	52,448	334,406
1925	56,851	146,693	29,141	232,685	1930	69,426	178,944	76,825	325,195

Domestic and imported crude barite used in the manufacture of barium products in the United States in 1930, by States

State	Product manufactured	Plants [1]	Barite used
			Short tons
Illinois	Lithopone and chemicals	6	60,251
Missouri	Ground barite and chemicals	4	80,209
Pennsylvania	Lithopone and chemicals	2	46,317
New Jersey	do	3	40,610
California	Ground barite, lithopone, and chemicals	4	35,831
Delaware and Maryland	Lithopone	2	61,977
Georgia	Ground barite	1	
New York	Chemicals	1	
South Carolina	Ground barite	1	
West Virginia	Chemicals	1	
Colorado	do	1	
		26	325,195

[1] A plant producing more than one product is counted but once in arriving at State totals.

IMPORTS

The imports of crude barite for consumption in the United States decreased sharply from 85,729 short tons, valued at $284,436, in 1929, to 52,111 tons, valued at $179,579, in 1930, or 39 per cent in quantity and 37 per cent in value. However, the average declared or foreign market value per ton increased 13 cents (4 per cent)—from $3.32 in 1929 to $3.45 in 1930.

Crude barite imported for consumption in the United States, 1921–1930

Year	Short tons	Value [1]	Year	Short tons	Value [1]
1921	11,054	$59,371	1926	51,016	$195,004
1922	23,239	104,680	1927	70,274	253,284
1923	15,045	93,721	1928	61,765	190,756
1924	21,502	104,264	1929	85,729	284,436
1925	28,655	91,016	1930	52,111	179,579

[1] Value at port of shipment, on which duty is levied. Does not include railroad and ship freight charges to this country or import duty.

WORLD PRODUCTION

The following table shows the output of barite by various countries from 1926 to 1930, as far as statistics are available.

World production of barite, 1926–1930, in metric tons

[Compiled by M. T. Latus, of the Bureau of Mines]

Country	1926	1927	1928	1929	1930
Algeria	800	500	------------	1, 200	2, 403
Australia:					
New South Wales	203	203	20	154	176
South Australia	1, 770	1, 916	2, 404	2, 001	1, 560
Tasmania	------------	------------	------------	10	(1)
Western Australia	------------	------------	------------	2	(1)
Austria	966	1, 924	2, 243	300	496
Belgium	6, 100	1, 630	740	------------	(1)
Canada	91	51	115	95	60
France	38, 810	28, 300	30, 050	41, 625	(1)
Germany:					
Bavaria	26, 955	20, 035	23, 872	23, 406	17, 778
Prussia	135, 319	154, 794	232, 858	260, 811	217, 925
Saxony	------------	------------	1, 401	1, 870	(1)
Great Britain	43, 462	47, 605	50, 702	58, 011	59, 647
India (British)	2, 348	1, 747	3, 146	3, 810	(1)
Irish Free State	(1)	(1)	(1)	(1)	1, 524
Italy	31, 845	30, 677	27, 116	25, 955	23, 420
Rhodesia, Southern	27	13	77	264	249
Russia [2]	14, 389	8, 496	3, 937	(1)	(1)
Spain [3]	7, 941	7, 716	6, 163	5, 806	5, 552
United States	215, 795	230, 664	244, 525	251, 533	213, 126

[1] Data not available.

[2] Year ended Sept. 30.

[3] Includes the following quantities reported produced from quarries: 1926, 690 tons; 1927, 2,760 tons; 1928, 2,300 tons.

BARIUM PRODUCTS

Although the apparent sales of ground barite increased 1.5 per cent in quantity and 25 per cent in value, the falling off in the sales of lithopone and barium chemicals brought the total quantity and value of barium products manufactured and sold or used by producers in 1930 to the lowest figures since 1926. The total barium products sold or used by producers in 1930 amounted to 250,712 short tons, valued at $18,793,515, a decrease of 16 per cent in quantity and 19 per cent in value as compared with 1929. The amount of lithopone sold or used in 1930 decreased a little more than 20 per cent in quantity and a little less than 20 per cent in value from the preceding year, while the total amount of barium chemicals sold or used in 1930 decreased 18 per cent in quantity and 29 per cent in value as compared with 1929.

Barium products made from domestic and imported crude ores in the United States and sold or used by producers, 1929 and 1930

Product	1929			1930		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
Ground barite	54, 472	$914, 516	$16. 79	55, 284	$1, 140, 305	$20. 63
Lithopone	206, 315	19, 773, 864	95. 84	164, 065	15, 897, 683	96. 90
Barium chemicals [1]	38, 438	2, 466, 305	----------	31, 363	1, 755, 527	----------
	299, 225	23, 154, 685	----------	250, 712	18, 793, 515	----------

[1] To avoid duplication, the barium chemicals reported here do not include the output of firms that produce these chemicals from such products as barium chemicals and imported barite and witherite purchased in the open market; the total for barium chemicals is therefore not shown here.

REFINED GROUND BARITE

The total ground barite sold or used by producers during 1930 amounted to 55,284 short tons, valued at $1,140,305, an increase of 1.5 per cent in quantity and 24.7 per cent in value as compared with 1929. The average value per ton likewise showed an increase—from $16.79 in 1929 to $20.63 in 1930, or 23 per cent. Missouri was the center of the grinding industry, producing 53,671 tons of ground barite; part of this, however, was placed in stocks unsold.

Ground barite sold or used by producers in the United States, 1921–1930

Year	Number of plants	Short tons	Value		Year	Number of plants	Short tons	Value	
			Total	Average				Total	Average
1921	7	27,661	$622,871	$22.52	1926	5	57,812	$1,186,563	$20.52
1922	7	46,176	933,722	20.22	1927	7	57,658	1,166,294	20.23
1923	6	39,605	895,095	22.60	1928	8	64,425	1,332,228	20.68
1924	5	38,296	784,881	20.50	1929	8	54,472	914,516	16.79
1925	5	49,674	1,040,461	20.95	1930	6	55,284	1,140,305	20.63

LITHOPONE

Twelve plants producing lithopone were in operation in the United States in 1930 and sold or used 164,065 short tons of this material, valued at $15,897,683. In 1929 sales from the same 12 plants amounted to 206,315 tons, valued at $19,773,864. The 1930 figures represent a loss from the preceding year of 20.5 per cent in quantity and 19.6 per cent in value. The average value per ton increased slightly—from $95.84 in 1929 to $96.90 in 1930.

Lithopone sold or used by producers in the United States, 1921–1930

Year	Number of plants	Short tons	Value		Year	Number of plants	Short tons	Value	
			Total	Average				Total	Average
1921	15	55,016	$6,681,563	$121.45	1926	13	159,931	$16,062,197	$100.43
1922	13	83,360	9,214,040	110.53	1927	13	176,994	17,163,620	96.97
1923	11	98,199	11,608,443	118.21	1928	12	200,468	19,073,914	95.15
1924	11	109,469	12,531,397	114.47	1929	12	206,315	19,773,864	95.84
1925	11	145,019	15,186,147	104.72	1930	12	164,065	15,897,683	96.90

DISTRIBUTION OF LITHOPONE SALES

The following table shows the distribution of lithopone sales, by various consuming industries. The paint, varnish, and lacquer industries consume by far the larger part of the lithopone sold; sales in these fields dropped off relatively less than sales for certain other purposes in 1930. Although the quantity used by these industries decreased from 150,804 short tons in 1929 to 126,076 tons in 1930 (16 per cent) their proportion of the total sales increased from 73.1 per cent in 1929 to 76.8 per cent in 1930. The floor-covering and textile industries were the next largest consumers of lithopone, purchasing 23,656 tons—a decrease of 13,850 tons (37 per cent) from 1929. Their proportion of the total sales of lithopone fell from 18.2 per cent in 1929 to 14.4 per cent in 1930. The rubber industry purchased 5,997 tons of lithopone—a decrease of 1,179 tons (16 per cent) from

1929. Its proportion of the total lithopone sold increased slightly, rising from 3.5 per cent in 1929 to 3.7 per cent in 1930. Other lithopone-consuming industries used 8,336 tons in 1930, a decrease of 2,493 tons (23 per cent) from 1929.

Lithopone sold or used by producers, 1928–1930, by consuming industries

Industry	1928		1929		1930	
	Short tons	Percentage of total	Short tons	Percentage of total	Short tons	Percentage of total
Paints, varnish, and lacquers	149, 122	74. 4	150, 804	73. 1	126, 076	76. 8
Floor coverings and textiles	35, 416	17. 7	37, 506	18. 2	23, 656	14. 4
Rubber	6, 898	3. 4	7, 176	3. 5	5, 997	3. 7
Other	9, 032	4. 5	10, 829	5. 2	8, 336	5. 1
	200, 468	100. 0	206, 315	100. 0	164, 065	100. 0

GROWTH OF USE OF BARIUM PIGMENTS

The use of barite for the manufacture of lithopone has increased rapidly.

In 1918 the producers sold 62,403 short tons of lithopone. The amount sold increased annually until 1921, when, as a result of business depression throughout the country, it fell to 55,016 tons. From that year sales advanced steadily until 1929, when they reached 206,315 tons. In 1930, however, they fell to 164,065 tons, 20 per cent less than in 1929 and lower than in any year since 1926. This reduction, however, was relatively less than the reduction in sales of other pigments. Sales of lead pigments, for example, declined 31 per cent, and those of zinc pigments declined 27 per cent.

Barium, lead, and zinc pigments sold or used by producers in the United States, 1921–1930, in short tons

Year	Lithopone	Barium sulphate (blanc fixe)	Lead pigments [1]	Zinc pigments [2]	Year	Lithopone	Barium sulphate (blanc fixe)	Lead pigments [1]	Zinc pigments [2]
1921	55, 016	2, 471	181, 851	90, 432	1926	159, 931	(3)	162, 084	170, 782
1922	83, 360	7, 349	208, 756	148, 078	1927	176, 994	13, 395	171, 177	177, 310
1923	98, 199	6, 761	174, 822	150, 491	1928	200, 468	(3)	169, 974	185, 127
1924	109, 469	7, 796	202, 066	158, 199	1929	206, 315	(3)	162, 611	187, 760
1925	145, 019	11, 748	178, 901	183, 104	1930	164, 065	(3)	112, 448	136, 421

[1] White lead (dry and in oil) and white lead sulphate.
[2] Zinc oxide and leaded zinc oxide.
[3] Bureau of Mines not at liberty to publish figures

BARIUM CHEMICALS

The total barium chemicals sold or used by producers reporting to the Bureau of Mines decreased from 38,438 short tons, valued at $2,466,305, in 1929 to 31,363 tons, valued at $1,755,527, in 1930, or 18 per cent in quantity and 29 per cent in value. Sales of barium carbonate decreased 34 per cent in quantity and 42 per cent in value, while the average value of this chemical decreased from $56.95 per ton in 1929 to $49.82 in 1930—$7.13 or 13 per cent.

It should be noted that, to avoid duplication, the barium chemicals reported herein do not include the output of firms that produce these chemicals from such products as barium chemicals and imported barite and witherite purchased in the open market.

Barium chemicals sold or used by producers in the United States, 1929 and 1930 [1]

Chemical	1929			1930		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
Barium carbonate	7,902	$450,041	$56.95	5,224	$260,284	$49.82
Barium chloride	6,545	412,902	63.09	26,139	1,495,243	
Barium sulphate (blanc fixe)	23,991	1,603,362				
Other [2]						
	38,438	2,466,305		31,363	1,755,527	

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[1] To avoid duplication, the barium chemicals reported here do not include the output of firms that produce these chemicals from such products as barium chemicals and imported barite and witherite purchased in the open market; the total for barium chemicals is therefore not shown here.

[2] 1929: Binoxide, hydroxide, and sulphide; 1930: Binoxide, hydroxide, monoxide, oxide crystals, and sulphide.

Barium chemicals sold or used by producers in the United States, 1921–1930, in short tons [1]

Year	Barium carbonate	Barium chloride	Barium sulphate (blanc fixe)	Other barium chemicals [2]	Year	Barium carbonate	Barium chloride	Barium sulphate (blanc fixe)	Other barium chemicals [2]
1921	1,956	(3)	2,471	1,060	1926	5,394	4,592	(3)	11,925
1922	2,281	2,022	7,349	2,249	1927	5,969	3,708	13,395	871
1923	6,362	3,301	6,761	379	1928	7,626	5,224	(3)	21,119
1924	6,058	3,859	7,796	441	1929	7,902	6,545	(3)	23,991
1925	4,962	(3)	11,748	1,944	1930	5,224	(3)	(3)	26,139

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[1] To avoid duplication, the barium chemicals reported here do not include the output of firms that produce these chemicals from such products as barium chemicals and imported barite and witherite purchased in the open market; the total for barium chemicals is therefore not shown here.

[2] Figures cover chemicals, as follows—1921 and 1925: Chloride, hydroxide, and sulphide; 1922: Binoxide, hydroxide, sulphide, and sulphydrate; 1923–24: Hydroxide and sulphide; 1926: Hydroxide, sulphate, and sulphide; 1927: Binoxide, hydroxide, and sulphide; 1928–29: Binoxide, hydroxide, sulphate, and sulphide; 1930: Binoxide, chloride, hydroxide, monoxide, oxide crystals, sulphate, and sulphide.

[3] Included under "Other barium chemicals."

IMPORTS AND EXPORTS

With the exception of barium hydroxide and barium binoxide, the imports of barium compounds for consumption in the United States decreased in quantity and value in 1930 as compared with 1929. The decreases follow: Ground barite, 20 per cent in quantity and 22 per cent in value; lithopone, 17 per cent in quantity and 18 per cent in value; blanc fixe, 14 per cent in quantity and 21 per cent in value; witherite (natural barium carbonate), 41 per cent in quantity and 47 per cent in value; artificial barium carbonate, 17 per cent in quantity and 24 per cent in value; barium chloride, 91 per cent in quantity and 88 per cent in value; and barium nitrate, 34 per cent in quantity and 44 per cent in value. Imports of barium hydroxide increased from 202 short tons, valued at $11,809, in 1929 to 220 tons, valued at $12,235, in 1930, and those of barium binoxide increased from 133 pounds, valued at $21, to 222 pounds, valued at $28.

Barium compounds imported for consumption in the United States, 1921–1930

[Value at port of shipment]

Year	Ground barite		Lithopone		Barium binoxide		Blanc fixe (precipitated barium sulphate)		Artificial barium carbonate (chemically precipitated)	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1921	1, 002	$16, 942	5, 247	$432, 019	669	$127, 631	769	$22, 470	2, 238	$80, 603
1922	4, 696	59, 453	10, 763	885, 671	1, 009	189, 334	2, 187	76, 445	5, 212	210, 250
1923	6, 022	88, 741	10, 440	776, 383	905	152, 270	587	32, 063	1, 901	79, 482
1924	2, 830	38, 292	6, 830	543, 025	860	120, 374	1, 047	50, 465	3, 752	128, 217
1925	3, 203	40, 008	6, 330	478, 395	635	70, 553	1, 996	81, 439	7, 188	160, 164
1926	3, 347	44, 781	8, 686	661, 700	49	8, 157	2, 973	136, 697	9, 224	189, 167
1927	3, 259	38, 568	7, 979	656, 166	6	1, 264	2, 400	107, 179	4, 918	119, 014
1928	3, 098	33, 378	9, 885	808, 200	6	1, 310	3, 680	168, 923	5, 222	116, 241
1929	2, 924	34, 619	8, 409	725, 554	(1)	21	3, 501	168, 367	3, 206	69, 236
1930	2, 331	26, 905	7, 018	595, 597	(2)	28	2, 994	133, 260	2, 662	52, 427

Year	Natural barium carbonate (ground witherite)		Barium chloride		Barium nitrate		Barium hydroxide	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1921	668	$25, 188	2, 186	$72, 621	(3)	(3)	(3)	(3)
1922	1, 472	39, 114	1, 962	112, 785	[4] 179	[4] $16, 795	[4] 73	[4] $6, 573
1923	1, 557	41, 823	1, 278	75, 014	511	59, 766	181	16, 872
1924	2, 500	56, 415	2, 330	100, 810	513	54, 638	174	8, 241
1925	2, 390	63, 634	2, 167	67, 306	703	58, 192	120	5, 605
1926	3, 380	80, 679	1, 773	49, 426	602	49, 494	236	9, 789
1927	3, 300	65, 821	1, 577	45, 285	711	65, 284	222	12, 439
1928	4, 311	82, 434	1, 172	25, 253	789	69, 010	186	10, 031
1929	4, 376	99, 335	78	3, 049	615	56, 770	202	11, 809
1930	2, 562	52, 282	7	372	407	31, 985	220	12, 235

[1] 133 pounds.
[2] 222 pounds.
[3] Not separately recorded prior to tariff of Sept. 22, 1922.
[4] Sept. 22 to Dec. 31.

Exports of lithopone declined from 4,556 short tons, valued at $463,235, in 1929 to 3,665 tons, valued at $380,047, in 1930. The average value per ton, however, increased from $101.68 in 1929 to $103.70 in 1930—$2.02, or 2 per cent.

Lithopone exported from the United States, 1922–1930 [1]

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average			Total	Average
1922	1, 616	$169, 982	$105. 19	1927	2, 110	$222, 585	$105. 49
1923	1, 485	176, 624	118. 94	1928	3, 326	337, 565	101. 49
1924	923	104, 783	113. 52	1929	4, 556	463, 235	101. 68
1925	1, 287	132, 771	103. 16	1930	3, 665	380, 047	103. 70
1926	1, 941	200, 412	103. 25				

[1] Not separately recorded prior to 1922.

PRICES

Market quotations for crude barite at the end of 1930 were lower than the rather high levels attained 12 months before but compared favorably with those for the greater part of the preceding year. In Georgia, for example, the quotation for crude barite rose from $6.50 to $9 a long ton late in 1929 but dropped back to $6.50 late in March, 1930. In Missouri, crude ore (containing 95 per cent or more of barium sulphate and less than 1 per cent of iron) started the year at $7.75 to $8 a short ton and, following the usual seasonal trend, declined to around $7 a ton during the summer months. There is little production during the summer, as small producers spend most of their time on farm work; therefore, prices during this season are more or less nominal. In the autumn the upward movement of prices was much weaker than usual, and at the close of the year standard-grade ore was offered at $7 a ton or less, and lower-grade barite was down to $6.50 or even $6 a ton.

Washed and water-floated barite in Georgia was quoted at $18 a long ton until July, when quotations ceased. Water-ground barite from Missouri was quoted at $23 a short ton, "domestic, including barrels, f. o. b. St. Louis," for the entire year.

The accompanying table gives the range of quotations on barite and barium products, 1928 to 1930. Quotations on crude barite are taken from the Engineering and Mining Journal and represent prices in Missouri. Quotations on ground barite are taken from the Oil, Paint and Drug Reporter and represent prices at St. Louis; quotations on lithopone and barium chemicals are taken from the same source and represent prices at New York.

Range of quotations on barite and barium products, 1928–1930

	Unit	1928	1929	1930
Crude barite (93 per cent $BaSO_4$)	Short ton	$6.50 –$7.50	$7.00–$8.00	[1] $7.00 –$8.00
Ground barite	do	23.00	23.00	23.00
Lithopone	Pound	.05¼	.05¼	.05
Barium carbonate	Short ton	47.50 –60.00	57.50–60.00	47.00
Barium chlorate	Pound	.14 – .15	.14– .15	.14 – .15
Barium chloride	Short ton	48.00 –63.00	63.00–65.00	63.00 –65.00
Barium nitrate	Pound	.08¼– .08½	.08– .08½	.07¼– .08
Barium sulphate (blanc fixe), dry	do	.03½– .04¼	.03¾	.04½
Barium sulphate (blanc fixe), pulp	Short ton	40.00 –60.00	42.50–45.00	42.50 –45.00

[1] 95 per cent of barium sulphate and less than 1 per cent of iron.

The following are the designations on which quotations in the preceding table are based.

Crude barite, "f. o. b. mines," Missouri.
Ground barite, "domestic including barrels, f. o. b. St. Louis."
Lithopone, "barrels, c. l."
Barium carbonate, "bags, works."
Barium chlorate, "kegs."
Barium chloride, "crystals, bags, works."
Barium nitrate, "casks."
Barium sulphate (blanc fixe), "dry, barrels, c. l., f. o. b. works."
Barium sulphate (blanc fixe), "pulp, works."

PRODUCERS

Producers of barium products in the United States active in 1930 are listed below, with the addresses of their main offices and the locations of their plants.

Ground barite:	
Chemical & Pigment Co. (Inc.) (grinding plant), Oakland, Calif	Oakland, Calif.
Clinchfield Sand & Feldspar Co., Baltimore, Md	Kings Creek, S. C.
C. P. De Lore Co., St. Louis, Mo	St. Louis, Mo.
National Pigments & Chemical Co., St. Louis, Mo	Adelbert and St. Louis, Mo.
Thompson, Weinman & Co. (Inc.), Cartersville, Ga	Cartersville, Ga.
Lithopone:	
Chemical & Pigment Co. (Inc.) (lithopone plant), Oakland, Calif	Oakland, Calif.
Do	Collinsville, Ill.
Do	St. Helena, Md.
Eagle-Picher Lead Co., Chicago, Ill	Argo, Ill.
Grasselli Chemical Co., Cleveland, Ohio	Grasselli, N. J.
Do	Newark, N. J.
Do	Philadelphia, Pa.
Krebs Pigment & Chemical Co., Newport, Del	Newport, Del.
Mineral Point Zinc Co., care New Jersey Zinc Co., New York, N. Y	Depue, Ill.
New Jersey Zinc Co. (of Pennsylvania), New York, N. Y	Palmerton, Pa.
Sherwin-Williams Co., Cleveland, Ohio	Chicago, Ill.
United Color & Pigment Co., Newark, N. J	Newark, N. J.
Barium chemicals:[3]	
Alton Barium Products Co., Alton, Ill	Alton, Ill.
Barium Products (Ltd.), Modesto, Calif	Modesto, Calif.
Barium Reduction Corporation & Barium Mining Corporation, Charleston, W. Va	Charleston, W. Va.
Chemical & Pigment Co. (Inc.), Collinsville, Ill	Collinsville, Ill.
Chicago Copper & Chemical Co., Chicago, Ill	Blue Island, Ill.
Grasselli Chemical Co., Cleveland, Ohio	Grasselli, N. J.
Do	Philadelphia, Pa.
Great Western Sugar Co., Denver, Colo	Johnstown, Colo.
Los Angeles Chemical Co., Los Angeles, Calif	South Gate, Calif.
Oakland Chemical Co., New York, N. Y	New York, N. Y.
Titanium Pigment Co. (Inc.), St. Louis, Mo	Carondelet Station, St. Louis, Mo.

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[3] Includes only those using barite.

TALC AND SOAPSTONE[1]

By Oliver Bowles and B. H. Stoddard[2]

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INTRODUCTION

As soapstone consists chiefly of talc, from a geological and mineralogical standpoint its exploitation may be considered part of the talc industry. Commercially, however, the relation between these minerals is remote. Some waste soapstone is ground and sold in direct competition with impure talc, but aside from this small use the production of soapstone is a branch of the dimension-stone industry, whereas about 95 per cent of all talc produced is sold in pulverized form. Even massive talc, sometimes regarded as soapstone but more properly designated " steatite," has uses different from those of soapstone, namely, lava products and crayons; however, soapstone may be used to a limited extent for the latter purpose. From a commercial standpoint, therefore, talc and soapstone deserve separate discussions. The main part of this report deals with talc almost exclusively and is followed by a brief discussion of soapstone.

TALC

GENERAL CONDITIONS

Commercial talc includes not only true talc—a hydrous silicate of magnesium—but also pyrophyllite, an aluminum silicate that is used for some of the same purposes as talc. The United States produces more talc than all the rest of the world. In 1930 the talc industry as a whole experienced some depression; commercial production decreased 18 per cent in quantity and 20 per cent in value, as compared with 1929. Sharp competition, accompanied by a tendency toward lower prices and lessened demand, restrained expansion of the industry. Practically all producers continued operations, however, and prices as a whole held fairly firm. Five new operators entered the field—one each in California, Nevada, and Vermont and two in North Carolina.

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[1] Work on manuscript completed October, 1931.

[2] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Reduced demand was reflected in the imports of talc for consumption, decreases of 17 per cent in quantity and 21 per cent in value being recorded, in comparison with 1929. With the exception of 1928 and 1929, however, the tonnage imported in 1930 was higher than for any year on record.

COMPOSITION AND PROPERTIES

Talc is a hydrous magnesium silicate having a chemical composition represented by the formula $H_2Mg_3(SiO_3)_4$. It contains 31.7 per cent of magnesia (MgO), 63.5 per cent of silica (SiO_2), and 4.8 per cent of water (H_2O). Commercial talc is rarely pure, as it contains varying quantities of clay, iron oxide, silica, calcite, and dolomite, together with sodium and potassium compounds. It occurs in fine granular, flaky, and occasionally fibrous form.

Its most pronounced and most easily recognizable physical properties are softness (it may be easily scratched with the finger nail and ranks as 1 in the scale of hardness, whereas limestone is 3) and soapy feel. It has superior properties of resisting and retaining heat and is also very resistant to the action of practically all acids and alkalies. It has high dielectric strength and is colloidal in finely ground form. In color it ranges from pure white to various shades of gray, green, and yellow.

The mineral pyrophyllite, a hydrous silicate of aluminum having the chemical formula $H_2Al_2(SiO_3)_4$, closely resembles talc in color, luster, and feel and is employed as a substitute for it in many uses.

ORIGIN AND OCCURRENCE

Talc occurs in commercial quantities only in areas of regional metamorphic rock. It generally results from alteration of magnesian minerals such as amphibole and pyroxene. Most domestic talc is found in the mountainous areas of the Atlantic States and in California and Washington. Many deposits are in the form of irregular, more or less lenticular bodies. If alteration has not been complete some of the original magnesian rocks may be present as impurities.

USES

The uses of talc are determined in large measure by its characteristic properties. Thus, its colloidal nature makes it valuable as a filler in paper and other products, and its high retention is advantageous in the paper-making process. Its soft soapy feel and absence of grit render it peculiarly adaptable to the manufacture of toilet powders and cosmetics. Because of their electrical resistance and remarkable property of hardening under heat treatment certain pure massive varieties are useful for the manufacture of so-called lava products, such as gas tips and electric insulators.

Ground talc is used extensively as filler in paper, paint, rubber, textiles, and various other products. It is also used for foundry facings, lubricants, and various toilet preparations such as talcum powder; in ceramics and glass making; and as a polishing agent for peanuts and rice, an insecticide, and an insulating material for underground conduits. Large quantities of low-grade talc are used in the manufacture of composition roofing, both as surface material to increase weather-resisting qualities and as a nonadhesive coating to prevent sticking. It is also used in rubber factories to prevent rubber compounds from adhering to hot rollers. Off-color talc is consumed in increasing amounts for rock dusting coal mines.

Massive talc free from iron oxide or grit and without cracks or cleavage planes is used for lava products. The forms, which are easily shaped in the natural soft condition, are heated to about 1,100° C. Such calcination has the peculiar effect of rendering the product hard enough to cut glass; yet the expansion, contraction, and distortion resulting from heating and subsequent cooling are so minute that the shapes, sizes, and even the accuracy of the milling remain unimpaired. The purer forms of massive talc adaptable to this use are employed chiefly for electrical insulation. Massive talc is also used in the manufacture of crayons, pencils, and French chalk (tailor's chalk).

PRODUCTION

The total quantity of talc sold by producers in the United States in 1930 was 179,385 short tons, valued at $2,108,338. As compared with 1929, these figures represent decreases of 18 per cent in quantity and 20 per cent in value. The figures comprise 4,972 tons of crude talc, valued at $48,913; 385 tons of sawed and manufactured talc, valued at $90,370; and 174,028 tons of ground talc, valued at $1,969,055. Of the total sales New York supplied 93,216 tons, valued at $1,192,604, as compared with 109,543 tons, valued at $1,439,272, in 1929, a decrease of 15 per cent in quantity and 17 per cent in value; Vermont supplied 45,881 tons, valued at $399,548, as compared with 60,469 tons, valued at $546,658, in 1929, a decrease of 24 per cent in quantity and 27 per cent in value; and California supplied 14,993 tons, valued at $219,246, as compared with 17,620 tons, valued at $256,977, in 1929, a decrease of 15 per cent in both quantity and value. Eighty-six per cent of the total sales of talc (both quantity and value) in the United States in 1930 was contributed by California, New York, and Vermont. The remainder of the output was produced in Georgia, Maryland, Nevada, New Jersey, North Carolina, Pennsylvania, Virginia, and Wisconsin.

Sales of talc and soapstone by producers over a series of years are shown in the table following:

Talc and soapstone sold by producers in the United States, 1921–1930, by classes

Year	Crude		Sawed and manufactured				Ground		Total	
			Talc		Soapstone					
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1921	2,150	$12,911	(1)	(1)	[1]17,423	[1]$627,826	102,413	$1,115,205	121,986	$1,755,942
1922	4,981	22,582	654	$86,333	22,700	712,144	170,349	2,038,838	198,684	2,859,897
1923	5,706	50,125	682	114,772	22,857	932,098	167,447	1,915,258	196,692	3,012,253
1924	5,710	22,247	846	109,405	25,630	1,288,885	171,635	2,095,019	203,821	3,515,556
1925[2]	5,684	24,533	895	107,691	(3)	(3)	175,677	1,879,569	182,256	2,011,793
1926[2]	5,988	26,723	1,528	130,253	(3)	(3)	174,052	1,954,018	181,568	2,110,994
1927[2]	5,706	25,365	1,494	111,650	(3)	(3)	185,116	2,097,709	192,316	2,234,724
1928[2]	6,360	48,031	936	70,394	(3)	(3)	195,680	2,419,569	202,976	2,537,994
1929[2]	11,228	87,820	473	140,928	(3)	(3)	208,082	2,399,914	219,783	2,628,662
1930[2]	4,972	48,913	385	90,370	(3)	(3)	174,028	1,969,055	179,385	2,108,338

[1] Talc included under "Soapstone."
[2] Figures represent talc only.
[3] Bureau of Mines not at liberty to publish figures for soapstone.

Talc sold by producers in the United States, 1928–1930, by classes

Form in which sold	1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value
Rough (crude)	6,360	$48,031	11,228	$87,820	4,972	$48,913
Sawed and manufactured[1]	936	70,394	473	140,928	385	90,370
Ground[2]	195,680	2,419,569	208,082	2,399,914	174,028	1,969,055
	202,976	2,537,994	219,783	2,628,662	179,385	2,108,338

[1] For slate pencils and metal-worker's crayons and for blanks used in making acetylene burners and other objects.
[2] For filler in paper, paint, and rubber goods, and for toilet powder, foundry facings, textiles, lubricators, electric insulation, etc.

REVIEW BY STATES

The following table gives the quantity and value of the talc sold by producers in the various States in the last three years.

Talc sold by producers in the United States, 1928–1930, by States

State	1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value
California	17,830	$271,413	17,620	$256,977	14,993	$219,246
Georgia	(1)	(1)	4,989	146,025	(1)	(1)
Maryland	(1)	(1)	(1)	(1)	(1)	(1)
Nevada					50	600
New Jersey[2] and Pennsylvania	(1)	(1)	(1)	(1)	(1)	(1)
New York	107,321	1,504,103	109,543	1,439,272	93,216	1,192,604
North Carolina	(1)	(1)	9,439	81,306	(1)	(1)
Vermont	52,125	502,501	60,469	546,658	45,881	399,548
Virginia	3,997	37,993	5,185	47,646	(1)	(1)
Wisconsin			4,350	14,238	1,078	3,499
Undistributed	21,703	221,984	8,188	96,540	24,167	292,841
	202,976	2,537,994	219,783	2,628,662	179,385	2,108,338

[1] Included under "Undistributed."
[2] No production from New Jersey in 1928.

California.—Over 85 per cent of the marketed production of talc in California in 1930 was mined in Inyo and San Bernardino Counties. With sales of 14,993 short tons, valued at $219,246, the State ranked third in order of total marketed production. All talc produced in California in 1930 was ground before being sold, the average value per ton being $14.62. Supply slightly exceeded demand. The talc was consumed by industries engaged in the manufacture of cosmetics, paint, rubber, paper, tile, concrete admixture, and other products. The output of high-grade talc from San Bernardino County is reported to be steadily supplanting imported talc for use in the manufacture of talcum powders.

Georgia.—In 1930 commercial production of talc in Georgia was obtained from the mines of the Cohutta Talc Co. and the Georgia Talc Co. on Fort and Cohutta Mountains, Murray County. The mineral represents an alteration of peridotite, which has been intruded in quartzite and quartz schist. The talc occurs on the borders of the intrusions, which are mainly massive and in the nature of soapstone. The talc is sawed or manufactured into crayons and pulverized for use in the manufacture of composition roofing, automobile tires, and other products. Marketed production decreased in both quantity and value as compared with 1929.

Maryland.—The only company producing high-grade talc in Maryland in 1930 was the Harford Talc Co. of Baltimore. The product is utilized in the manufacture of lava tips for gas burners, of electrical insulators, and of heat-resisting parts. The product of the Oursler property near Henryton, Carroll County, is an impure talc schist used principally for foundry facings.

Nevada.—Operations in Nevada were conducted by a new operator, R. H. Rowland, whose property (Surprise mines Nos. 1 and 2) is 9 miles east of Oreana, Pershing County. The product (pyrophyllite) was sold to a consumer on the Pacific coast. The records show that the 1930 output was the first of pyrophyllite or talc to be shipped from this State.

New Jersey and Pennsylvania.—The Rock Products Co. operated, as usual, its property at Phillipsburg, N. J. The product—talc dust—was sold in crude form. Operations in Pennsylvania were conducted at the Fox quarry near Easton by C. K. Williams & Co. This region, which is limited to the vicinity of Easton, produces talc that is associated with serpentine; hence, the trade name "verdolite." The rock is ground and used largely in the manufacture of paint, plaster, paper, soap, and rubber goods.

New York.—The three producers in New York contributed more than half of the marketed production of talc in the United States in 1930. Compared with 1929 the quantity decreased 15 per cent and the value 17 per cent. The product was sold in ground form; it averaged $12.79 a ton.

North Carolina.—North Carolina is the fourth State in order of production. Both talc and pyrophyllite were mined and sold in 1930, the larger part being pyrophyllite. The output was sold in crude form, as crayons or pencils, or powdered. As compared with 1929 the marketed production showed an increase in both quantity and value. Two new operators reported sales—the Nantahala Co., Andrews (which leased on January 1, 1930, the high-grade talc property at Hewitt from the North Carolina Talc & Mining Co.), and the Craig L. Rudisell Talc Co., Marshall, which operated property near Marshall and produced talc crayons. The Tallassee Power Co., 2400 Oliver Building, Pittsburgh, Pa., a new producer of pyrophyllite in 1929, made no sales in 1930, but used its production in experimental operations. The Binney & Smith Co. is now known as the Notla Talc Co., Murphy. The Standard Mineral Co. (Inc.), Hemp, mined pyrophyllite, as usual, at its property near Hemp, Moore County.

Vermont.—Vermont ranked second, as usual, in the total production of talc in the United States in 1930. The total sales for the State—45,881 short tons, valued at $399,548—showed a decrease of 24 per cent in quantity and 27 per cent in value, as compared with 1929. Most of the material was sold ground at an average value of $8.40 a ton. A few tons of talc crayons were manufactured and sold by the Eastern Magnesia Talc Co. (Inc.), Burlington. The Vermont Mineral Products (Inc.), Chester, a new producer, shipped its product in ground form for use in the manufacture of composition roofing and plasters, and as a filler in the paper industry. The company erected a grinding plant during the year.

Virginia.—Activities in Virginia in 1930 were about the same as in 1929. No new operations were reported. The State recorded decreases in both quantity and value of sales of talc and soapstone as a result of general business conditions. Talc was produced in Fairfax and Franklin Counties. In 1930 Virginia talc was used chiefly in the manufacture of foundry facings. Soapstone was produced in Nelson County, and is discussed on page 313.

Wisconsin.—The American Talc Co., Plymouth, continued operations at its property near Milladore, Wood County, from which sales were made for the first time in 1929. The product was all sold in crude form to a mid-western dealer for grinding.

LIST OF PRODUCERS

Producers of talc and soapstone in the United States in 1930

Name and address	Location of mine
CALIFORNIA	
American-Italian Talc Co., 1407 East Sixth Street, Los Angeles.	9 miles west of Bigpine, Inyo County.
W. S. McLean, 1919 San Bruno Avenue, San Francisco	Butte County.
Pacific Coast Talc Co., 2149 Bay Street, Los Angeles	7 miles north of Silver Lake station, San Bernardino County.
Sierra Talc Co., 428 Union League Building, Los Angeles.	Near Darwin, Inyo County.
Western Talc & Magnesite Co., 1901 East Slauson Avenue, Los Angeles.	Tecopa, Inyo County.
John L. Witney (Inc.), Jamestown	Near Jamestown, Tuolumne County.
GEORGIA	
Cohutta Talc Co., Dalton	Chatsworth, Murray County.
Georgia Talc Co., Asheville, N. C	Foot of Cohutta Mountain, 3¼ miles southeast of Chatsworth, Murray County.
MARYLAND	
Harford Talc Co., 1516 Continental Building, Baltimore.	Near Dublin, Harford County.
Herbert I. Oursler, Marriottsville	Near Henryton, Carroll County.
NEVADA	
R. H. Rowland, Oreana	9 miles east of Oreana, Pershing County.
NEW JERSEY	
Rock Products Co., 403 Trust Building, Easton, Pa	Above Marble Hill, on Delaware River near Phillipsburg, Warren County.

Producers of talc and soapstone in the United States in 1930—Continued

Name and address	Location of mine
NEW YORK	
Carbola Chemical Co. (Inc.), Natural Bridge	1¼ miles from Natural Bridge, Lewis County.
International Pulp Co., 41 Park Row, New York City	Talcville, St. Lawrence County.
W. H. Loomis Talc Corporation, 173 East Main Street, Gouverneur.	Fowler, St. Lawrence County.
NORTH CAROLINA	
Nantahala Co., Andrews	Hewitt, Swain County.
Notla Talc Co., Murphy	Near Murphy, Cherokee County.
Craig L. Rudisell Talc Co., Marshall	Near Marshall, Madison County.
Standard Mineral Co. (Inc.), Hemp	2½ miles from Hemp, Moore County.
PENNSYLVANIA	
C. K. Williams & Co., 640 North Thirteenth Street, Easton.	Near Easton, Northampton County.
VERMONT	
American Soapstone Finish Co. (Inc.), Chester	2½ miles from Chester, Windsor County.
Eastern Magnesia Talc Co. (Inc.), Burlington	Johnson, Lamoille County, and Waterbury, Washington County.
Vermont Mineral Products (Inc.), Chester	Near Chester, Windsor County.
Vermont Talc Co., Chester	Windham, Windham County.
VIRGINIA	
Blue Ridge Talc Co. (Inc.), Henry	Near Henry station, Franklin County.
Bull Run Talc & Soapstone Co. (Inc.), Clifton Station	3 miles north of Clifton, Fairfax County.
Old Dominion Soapstone Co., 1516 Continental Building, Baltimore, Md.	Near Clifton, Fairfax County.
Virginia Alberene Corporation, 153 West Twenty-third Street, New York, N. Y.	Schuyler, Nelson County.
WISCONSIN	
American Talc Co., Plymouth	Milladore, Wood County.

PRICES

Prices of talc depend on the grade, which determines the purpose for which it is to be used. The average price in the rough as it came from the mine in 1930, for the United States as a whole, was $9.84 per short ton. Some of it sold as low as $3.50 a ton, while other material sold as high as $50 a ton. Talc, sawed and manufactured into crayons, pencils, etc., sold at an average of $235 a ton. White Vermont talc, 99 per cent through 200 mesh, was quoted regularly throughout 1930 at $8 to $8.50 a ton. Double air-floated short-fiber 200-mesh New York talc maintained a price of $13.75 a ton and 325-mesh material $14.75. Various grades of Georgia talc ranged from $5 to $13 a ton. The above prices are f. o. b. mills in carload lots. Total sales of ground talc sold at an average of $11.31 a ton. The total average value per short ton of Italian talc imported into the United States in 1930 was $27.04; total imports of Canadian talc averaged $11.35 and of French talc $11.55 a ton.

NEW TRENDS IN UTILIZATION

Several interesting developments have been noted recently which indicate wider use of talc in fields where it has been employed to a limited extent, if at all, in the past. It has found some use as an admixture or fine aggregate in concrete; and satisfactory service rendered by talc from Gouverneur, N. Y., in certain types of concrete construction has encouraged wider use. Some of the advantages claimed are as follows: Talc increases plasticity, which cuts down labor in puddling and placing and gives close contact under beams; it increases the acid resistance of concrete, which is an advantage in railroad tunnels where the concrete is exposed to sulphur fumes of locomotive smoke; and it increases the strength and water resistance of concrete.

Talc is finding increasing use as a raw material in ceramics. The body of certain glazed wall tile contains a high percentage of talc, a use which is already consuming the mineral in carload lots. It is claimed also that addition of talc as a constituent greatly increases the life of saggers, containers in which delicate ceramic wares are placed for kiln firing. Talc is also recommended for use in the manufacture of both clear and opal glass, as it increases the resistance of glass to chemical attack and mechanical shock.

The dusting of coal mines with light-colored inert powders to prevent or check dust explosions is consuming large tonnages of various mineral products. Limestone is the most widely used, but talc is employed in increasing quantities. As this is a low-priced market, only the lower and more impure grades of both talc and soapstone are thus used.

Talc is employed in a small way as an insecticide. Its chief function is not as a poison carrier but as a coating material that kills the insect or other destroying organism by closing its pores. Its sticky consistency also tends to keep insects away.

A development of interest is the erection at Stourport, England, of a factory to be devoted in part to the manufacture of high-tension insulators from massive talc (steatite). Steatite insulators not only have high dielectric strength but also unusually high tensile strength. Specifications for raw materials are very exacting.

IMPORTS AND EXPORTS

Talc imported for consumption in the United States, 1921–1930

Year	Crude and unground steatite and French chalk		Manufactures (except toilet preparations) wholly or partly finished [1]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1921	153	$2,279	11,468	$239,469	11,621	$241,748
1922	248	9,850	18,196	367,528	18,444	377,378
1923	560	20,653	19,405	402,238	19,965	422,891
1924	313	4,847	17,496	337,508	17,809	342,355
1925	121	6,547	20,872	443,985	20,993	450,532
1926	199	16,366	23,642	523,716	23,841	540,082
1927	377	27,326	24,817	523,056	25,194	550,382
1928	459	33,276	26,590	546,639	27,049	579,915
1929	1,228	74,840	29,949	596,789	31,177	671,629
1930	722	28,306	25,057	501,516	25,779	529,822

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[1] Prior to Sept. 22, 1922, the classification was "Talc, steatite, and French chalk—cut, ground, or washed."

Of the total 25,779 tons imported for consumption in the United States in 1930, 722 tons, valued at $28,306, were crude material.

Talc, steatite or soapstone, and French chalk, crude, manufactured, or ground, imported into the United States, 1929 and 1930, by countries

[General imports]

Country	1929		1930	
	Short tons	Value	Short tons	Value
Africa:				
British—				
Union of South Africa	54	$1,618	123	$2,971
Other British South Africa			1	20
Portuguese—Mozambique	70	1,463	22	419
Austria	116	3,376	149	4,438
Belgium	55	243		
Canada	10,482	125,893	7,580	86,012
China	168	68,518	350	63,231
Cuba	(1)	6		
Czechoslovakia			(1)	70
France	10,401	127,439	7,785	89,886
Germany	150	2,373	30	1,992
Hong Kong	(1)	30	(1)	101
India (British)	673	35,084	447	22,484
Italy	8,819	292,106	8,557	231,378
Japan	24	3,584	162	5,634
Kwantung	1	30	1	26
Philippine Islands	(1)	7		
Soviet Russia in Europe	34	724	(1)	94
Spain	59	1,720	1	40
United Kingdom	141	7,096	4	278
	31,247	671,310	25,212	509,074

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[1] Less than 1 ton.

The exports of "talcum and other toilet powders" in 1922 amounted to 1,821 short tons, valued at $1,397,542; in 1923, 1,907 tons, valued at $1,671,588; in 1924, 1,614 tons, valued at $1,688,211; in 1925, 1,734 tons, valued at $1,882,196; in 1926, 1,645 tons, valued at $1,726,933; in 1927, 1,627 tons, valued at $1,621,068; and in 1928, 1,568 tons, valued at $1,605,630. Exports of "powders—talcum, face, compact, and bath and other toilet powders" in 1929 were valued at $1,592,301; quantity not recorded. In 1930 exports of talcum powder (in bulk) amounted to 956,050 pounds, valued at $36,410. Exports of "powders—talcum (in packages), face, and compact toilet powders" were valued at $1,447,928; quantity not recorded. Similar exports were not separately classified prior to 1922.

TARIFF

The import duty on talc and steatite or soapstone, as fixed by the tariff act which became effective June 18, 1930, is as follows:

Talc, steatite or soapstone, and French chalk, crude and unground, one-fourth of 1 cent per pound; ground, washed, powdered, or pulverized (except toilet preparations), 35 per centum ad valorem; cut or sawed, or in blanks, crayons, cubes, disks, or other forms, 1 cent per pound; manufactures (except toilet preparations), of which talc, steatite or soapstone, or French chalk is the component material of chief value, wholly or partly finished, and not specially provided for, if not decorated, 35 per centum ad valorem; if decorated, 45 per centum ad valorem.

WORLD PRODUCTION

The following table gives the world production of talc and soapstone, in so far as figures are available.

World production of talc and soapstone, 1926–1930, by countries, in metric tons

[Compiled by M. T. Latus, of the Bureau of Mines]

Country [1]	1926	1927	1928	1929	1930
Australia:					
New South Wales	366	488	674	555	280
South Australia	560	629	641	776	811
Tasmania	------	------	32	23	14
Austria (exports)	13,861	17,135	19,755	19,603	(2)
Canada	14,304	14,988	[3] 13,540	[3] 14,069	[3] 10,742
China [4]	(2)	23,000	(2)	(2)	(2)
Finland	------	1,050	4,725	2,848	2,800
France	75,740	75,600	89,500	105,560	(2)
Germany (Bavaria)	3,834	6,381	7,872	6,805	5,794
Great Britain	------	------	164	29	188
Greece	151	213	30	150	(2)
India (British)	9,829	5,134	5,628	7,333	(2)
Italy	43,075	32,940	33,030	40,810	38,131
Japan [5]	(2)	59,947	(2)	(2)	(2)
Morocco, French (exports)	478	2	535	610	(2)
Norway	7,608	7,607	7,822	8,332	(2)
Rumania	488	1,138	2,164	1,077	3.353
Russia [6]	2,995	2,118	5,568	(2)	(2)
Spain	1,658	3,843	5,302	5,164	5,032
Sweden	[7] 3,221	3,475	4,876	7,026	(2)
Union of South Africa (Transvaal)	76	307	541	464	380
United States [8]	164,715	174,465	184,136	199,383	162,734
Uruguay (exports)	897	36	985	786	(2)

[1] In addition to the countries listed, Argentina and Brazil produce a small quantity of talc. No data of production are available. Rail and river shipments in Argentina for 1928 were reported as 440 kilograms.
[2] Data not available.
[3] Exclusive of soapstone for which value only is given.
[4] Talc only. Estimated production (China, Geological Survey Special Report).
[5] Includes agalmatolite.
[6] Year ended Sept. 30.
[7] Exclusive of a small quantity for which value only is given.
[8] Figures represent talc only. Bureau of Mines not at liberty to publish figures for soapstone.

Estimating the production of Japan, China, and Russia at about 88,000 tons, world production in 1929 was divided about as follows: United States, 39 per cent; France, 21 per cent; Italy, 8 per cent; Germany and Austria, 5 per cent; and Canada, 3 per cent.

SOAPSTONE[3]

DEFINITION

The term " soapstone " in its original sense apparently was synonymous with steatite (massive talc). More properly, however, the term includes all dark-gray to greenish talcose massive rocks which have a soapy feel and which with few exceptions are soft enough to be carved easily with a knife. Practically all soapstone produced commercially is metamorphic rock containing only 50 to 80 per cent of talc intimately mixed with varying proportions of chlorite, amphibole, pyroxene, and mica, with smaller amounts of pyrite, quartz, calcite, or dolomite. Soapstone, therefore, generally is a rock rather than a mineral.

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[3] More detailed information on the soapstone industry is given in a recent report entitled " Soapstone," by H. Herbert Hughes: Inf. Circ. 6563, Bureau of Mines, 1931, 18 pp.

USES

The uses of soapstone are intimately related to its physical properties. Its easy workability, light color, and resistance to weathering or water action fit it admirably for many structural uses, such as laundry tubs, aquariums, wainscoting, mantels, baseboard, stair treads, tiles, and spandrels. Its resistance to chemical action adapts it for wide application in the form of laboratory table tops, sinks, hoods, ovens, acid tanks, trays, development tanks for photographs and blue prints, drains, and furnace blocks for lining retorts in paper mills. Some soapstones have high dielectric strength and are used for switchboards and other electrical purposes. On account of its ability to resist and to retain heat soapstone is employed for griddles, foot warmers, fireless-cooker stones, fireplaces, hearths, and furnace linings. Pulverized waste material is employed in the roofing industry, as an admixture in concrete, as a filler, and for dusting coal mines.

PRODUCTION CENTERS

The soapstone industry of the United States is unique in that it is virtually in the hands of one company, the Virginia Alberene Corporation, with mills and quarries at Schuyler, Va. The deposits near that place consist of irregular or lenslike dikes bordered with mica schist and peridotite and are regarded as alteration products of basis igneous rock. Many openings have been made, averaging about 100 by 120 feet in size and 100 to 200 feet in depth. Very large and well-equipped mills are maintained where blocks are sawed into slabs and fabricated into a great variety of products.

Small amounts of soapstone have been produced in Maryland, North Carolina, and Rhode Island. It was first produced in Canada in 1922 from a deposit at Robertson, Quebec; and the industry has attained considerable magnitude, the value of sales in 1930 amounting to $50,168. It is shipped in block form for furnace lining in kraft-paper mills. Soapstone is quarried at Gudbrandsdal, Norway, for structural purposes. Deposits are reported in other countries, but foreign production, except as mentioned above, is confined to local uses. A large part of the world demand for slab soapstone is met by exports from the United States.

During recent years so large a part of the production has been in the hands of a single company that figures can not be published without revealing individual statistics. Production a number of years ago is shown in the table on page 306.

PHOSPHATE ROCK[1]

By BERTRAND L. JOHNSON[2]

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GENERAL CONDITIONS

In 1930 the phosphate-rock industry of the United States enjoyed a continuation of the upward trend in domestic demand and showed continued recovery from the slight depression of 1928 in foreign demand. In the domestic market the demand for Florida land-pebble phosphate rock was greater in 1930 than in 1929, and larger quantities were mined and marketed. The quantity and value of Florida hard rock marketed in 1930 also increased, owing to increased sales for consumption in the United States. Tennessee suffered slight setbacks in both mined and marketed production in 1930; but the tonnage sold was, with only three exceptions (the boom years, 1907, 1920, and 1929), the highest in the history of the State's phosphate-rock industry. There was marked increase both in mine production and in sales in the Western States in 1930. Despite the improvement in sales, the total mined production of phosphate rock in the United States in 1930 was greater than the marketed production. Consequently, stocks in the hands of domestic producers at the end of 1930 showed an increase over the tonnage on hand at the close of 1929.

In the export trade the general trends of the past few years in exports of both land pebble and high-grade hard rock continued, the trend for land pebble being upward and that for hard rock downward. Total exports increased in both quantity and value, the increase in land-pebble exports more than counterbalancing the decrease in hard-rock exports. Imports were lower in both quantity and value in 1930 than in 1929.

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[1] Work on manuscript completed September, 1931.

[2] Statistics on the domestic industry in this report prepared by B. H. Stoddard and data on imports and exports compiled from records of the Bureau of Foreign and Domestic Commerce by J. A. Dorsey, both of the Bureau of Mines.

DOMESTIC MINE PRODUCTION

The quantity of phosphate rock mined in the United States in 1930 was 3,951,353 long tons, an increase of 129,513 tons (3.4 per cent) over 1929, mainly as the result of greater production in Florida where the quantity of phosphate rock mined increased 135,598 tons (4.3 per cent). The quantity of Florida hard rock mined increased 3 per cent and that of land pebble 4.4 per cent. There was a decrease of 34,924 tons (5.3 per cent) in the Tennessee mine production and an increase of 28,839 tons (67.6 per cent) in the Western States.

Phosphate rock mined in the United States, 1921–1930, by States, in long tons

Year	Florida	Kentucky	South Carolina	Tennessee	Western States	Total
1921	2, 088, 251	15, 622	------------	317, 340	4, 961	2, 426, 174
1922	2, 018, 809	12, 236	------------	288, 330	17, 481	2, 336, 856
1923	2, 421, 571	18, 409	------------	469, 011	34, 575	2, 943, 566
1924	2, 373, 530	3, 424	------------	427, 614	40, 735	2, 845, 303
1925	2, 672, 650	14, 309	2, 147	480, 763	83, 802	3, 253, 671
1926	3, 064, 441	6, 097	------------	475, 742	45, 742	3, 592, 022
1927	2, 543, 708	------------	------------	432, 610	48, 831	3, 025, 149
1928	2, 905, 826	------------	------------	573, 601	43, 803	3, 523, 230
1929	3, 125, 941	------------	------------	653, 265	42, 634	3, 821, 840
1930	3, 261, 539	------------	------------	618, 341	71, 473	3, 951, 353

SALES OF DOMESTIC PHOSPHATE ROCK

Both the total quantity and the total value of phosphate rock sold or used by producers in the United States in 1930 were greater than in any other year except the boom year 1920. The quantity sold or used amounted to 3,926,392 long tons, an increase of 165,537 tons (4.4 per cent) over 1929; the total value was $13,996,830, an increase of $843,571 (6.4 per cent). The average selling value per ton for 1930 was $3.56, or 6 cents higher than the 1929 average.

Phosphate rock sold or used by producers in the United States, 1921–1930

Year	Long tons	Value	Year	Long tons	Value
1921	2, 064, 025	$12, 270, 070	1926	3, 209, 976	$10, 893, 800
1922	2, 417, 883	10, 482, 846	1927	3, 170, 699	11. 253, 352
1923	3, 006, 706	11, 576, 049	1928	3, 501, 406	12, 443, 179
1924	2, 867, 789	10, 252, 083	1929	3, 760, 855	13, 153, 259
1925	3, 481, 819	11, 545, 678	1930	3, 926, 392	13, 996, 830

DISTRIBUTION OF SALES BY USES

Phosphate rock was sold in 1929 and 1930 for a variety of uses—as a source of phosphorus in the manufacture of superphosphates, phosphates, phosphoric acid, phosphorus, and ferrophosphorus; in the phosphorizing of iron; for direct application to soil; for fertilizer filler; and as an ingredient of stock and poultry feed.

The following figures, compiled from estimates made by the producing companies from their sales records, indicate the distribution of sales by major uses in the United States.

Phosphate rock sold by producers in the United States for major uses, 1929 and 1930, in long tons

Use	1929	1930
Superphosphates	2,249,761	2,379,757
Phosphates, phosphoric acid, and ferrophosphorus	[1] 321,851	[1] 281,805
Direct application to soil	61,224	41,593
Fertilizer filler	(2)	35,451
Stock and poultry feed	4,791	4,478
Miscellaneous	12,903	2,214
	2,650,530	2,745,298

[1] Includes quantities used for phosphorus and for phosphorizing pig iron.
[2] Included under "Miscellaneous."

SUPERPHOSPHATES

The greater part of the phosphate rock sold in the United States goes into the manufacture of the various superphosphates. In 1930 a total of 2,379,757 long tons of phosphate rock, or 87 per cent of the sales for which use was specified, is reported to have been sold for this purpose. The quantity so used was 129,996 tons greater in 1930 than in 1929.

The following domestic companies, covering nearly all those that made sales on the domestic market in 1930, sold rock for use in making superphosphates.

Amalgamated Phosphate Co., 535 Fifth Avenue, New York, N. Y. Pits near Brewster, Fla.

The American Agricultural Chemical Co., 420 Lexington Avenue, New York, N. Y. Pits near Brewster, Pierce, and Plant City, Fla., and Spring Hill, Tenn.

Anaconda Copper Mining Co. (fertilizer department), Conda, Idaho. Mine near Conda, Idaho.

Armour Fertilizer Works, 111 West Jackson Boulevard, Chicago, Ill. Pits near Columbia, Tenn.

Charleston Mining Co., 627 East Main Street, Richmond, Va. Mine at Gordonsburg and pits at Mountpleasant, Tenn.

Coronet Phosphate Co., 99 John Street, New York, N. Y. Pits near Pembroke and Plant City, Fla.

Dissett Bros., Philipsburg, Mont. Mine near Philipsburg, Mont.

Federal Chemical Co., Fourth Street and Broadway, Louisville, Ky. Pits at Century and Ridley, Tenn.

Hoover & Mason Phosphate Co., 8 South Michigan Avenue, Chicago, Ill. Pits at Mountpleasant, Tenn.

International Agricultural Corporation, 61 Broadway, New York, N. Y. Pits near Mulberry, Fla., and Mountpleasant and Wales, Tenn.

Montana Phosphate Products Co., Garrison, Mont. Mine near Garrison, Mont.

The Phosphate Mining Co., 110 William Street, New York, N. Y. Pits near Bartow, Fla.

Solar Development Co. (Ltd.), Trail, British Columbia, Canada. Mine near Paris, Idaho.

Southern Phosphate Corporation, Baltimore Trust Building, Baltimore, Md. Pits at Eaton Park and Lakeland, Fla.

Swift & Co., Union Stock Yards, Chicago, Ill. Pits near Fort Meade, Fla.

PHOSPHATES, PHOSPHORIC ACID, PHOSPHORUS, AND FERROPHOSPHORUS

The quantity of phosphate rock sold in 1930 for the manufacture of phosphates, phosphoric acid, phosphorus, and ferrophosphorus and for phosphorizing pig iron was 281,805 long tons, a decrease of about 12 per cent as compared with 1929. The following companies reported the production and sale of phosphate rock in 1930 for one or more of such purposes.

Amalgamated Phosphate Co., 535 Fifth Avenue, New York, N. Y. Pits near Brewster, Fla.

Anaconda Copper Mining Co. (fertilizer department), Conda, Idaho. Mine near Conda, Idaho.

C. & J. Camp, Ocala, Fla. Pit near Dunnellon, Fla.

Charleston Mining Co., 627 East Main Street, Richmond, Va. Mine at Gordonsburg and pits at Mountpleasant and Wales, Tenn.

Coronet Phosphate Co., 99 John Street, New York ,N. Y. Pits at Plant City, Fla.

Federal Chemical Co., Fourth Street and Broadway, Louisville, Ky. Pits at Century, Ridley, and Southport, Tenn.

Hoover & Mason Phosphate Co., 8 South Michigan Avenue, Chicago, Ill. Pits at Mountpleasant, Tenn.

International Agricultural Corporation, 61 Broadway, New York, N. Y. Pits near Mulberry, Fla.

The Phosphate Mining Co., 110 William Street, New York, N. Y. Pits near Bartow, Fla.

DIRECT APPLICATION TO SOIL

Statistics covering the sales of phosphate rock by producers for direct application to soil are available beginning with 1914. Sales for this purpose reached a maximum of 79,189 long tons in 1919, declined sharply in the 1921 business depression to 13,503 tons, and remained at low levels through 1924. In 1925 sales increased to about 32,000 tons and remained at approximately this level for the next two years. In 1928 sales rose to 42,145 tons, and in 1929 they increased still further to 61,224 tons. In 1930 sales amounted to 41,593 tons, a loss of 32.1 per cent as compared with 1929.

Phosphate rock sold by producers in the United States for direct application to soil, 1921–1930, in long tons

1921	13, 503	1926	29, 902
1922	16, 029	1927	32, 957
1923	10, 548	1928	42, 145
1924	14, 320	1929	61, 224
1925	31, 999	1930	41, 593

Various types of phosphate rock were ground in 1930 for direct application to soil. By far the greater part came from Tennessee, but Florida, Idaho, and Wyoming also contributed. Although both the blue and the brown phosphate rock were utilized in Tennessee, most of the grinding plants employed a washed and dried brown rock. One of the producing companies ground brown phosphate rock after removal of some of the nonphosphatic material by air separation. In Florida, land-pebble phosphate rock and phosphatic clay from the land-pebble district were used. The material used in the Western States was the unweathered rock phosphate of that region.

The producers of phosphate rock in 1930 for direct application to soil were as follows:

Anaconda Copper Mining Co. (fertilizer department), Conda, Idaho. Mine near Conda, Idaho.

Charleston Mining Co., 627 East Main Street, Richmond, Va. Mine at Gordonsburg and pits at Mountpleasant, Tenn.

Cokeville Phosphate Co., Cokeville, Wyo. Mine near Cokeville, Wyo.

Hoover & Mason Phosphate Co., 8 South Michigan Avenue, Chicago, Ill. Pits and plant at Mountpleasant, Tenn. Ground rock produced is all for account of Ruhm Phosphate & Chemical Co., Mountpleasant, Tenn.

International Agricultural Corporation, 61 Broadway, New York, N. Y. Pits and plant at Wales, Tenn.

Lakeland Phosphate & Fertilizer Co., Bartow, Fla. Pit and plant at Bartow, Fla.

The Phosphate Mining Co., 110 William Street, New York, N. Y. Pits near Bartow, Fla. Plant at Nichols, Fla.

Southern Phosphate Corporation, Baltimore Trust Building, Baltimore, Md. Pits at Eaton Park and Lakeland, Fla.

Tennessee-Illinois Phosphate Co., 137 South La Salle Street, Chicago, Ill. Pit and plant at Twomey, Tenn. Sales company, Thomson Phosphate Co., 137 South La Salle Street, Chicago, Ill.

FERTILIZER FILLER

Sales of phosphate rock by producers for fertilizer filler showed a substantial increase in 1930 over 1929. About one-half of the total of 35,451 long tons sold for this use was brown phosphate rock from Tennessee; the remainder was Tennessee blue phosphate rock and Florida land pebble.

Companies reporting the production and sale of phosphate rock in 1930 for this use were the following:

Charleston Mining Co., 627 East Main Street, Richmond, Va. Mine at Gordonsburg and pits at Mountpleasant, Tenn.

Harsh Phosphate Co., R. F. D. 7, East Station, Nashville, Tenn. Pit near Nashville, Tenn.

Lakeland Phosphate & Fertilizer Co., Bartow, Fla. Pit at Bartow, Fla.

The Phosphate Mining Co., 110 William Street, New York, N. Y. Pits near Bartow, Fla.

STOCK AND POULTRY FEED

The quantity of phosphate rock reported sold in 1930 for use as an ingredient in stock and poultry feed was 4,478 long tons, a decrease of 6.5 per cent as compared with 1929. Most of the rock sold for this purpose was Tennessee brown phosphate rock, but a considerable amount of Tennessee blue phosphate rock and a small quantity of Florida land-pebble phosphate were also sold for this purpose.

Companies reporting the production and sale of phosphate rock in 1930 for this use were the following:

Charleston Mining Co., 627 East Main Street, Richmond, Va. Mine at Gordonsburg and pits at Mountpleasant, Tenn.

Hoover & Mason Phosphate Co., 8 South Michigan Avenue, Chicago, Ill. Pits at Mountpleasant, Tenn. Ground rock produced for account of Ruhm Phosphate & Chemical Co., Mountpleasant, Tenn.

International Agricultural Corporation, 61 Broadway, New York, N. Y. Pits near Mulberry, Fla.

Tennessee-Illinois Phosphate Co., 137 South La Salle Street, Chicago, Ill. Pit and plant at Twomey, Tenn. Sales company, Thomson Phosphate Co., 137 South La Salle Street, Chicago, Ill.

STOCKS

Notwithstanding the increase in sales in 1930, producers' stocks increased 108,212 tons. Total stocks in hands of producers on December 31, 1930, amounted to approximately 968,750 long tons, of which about 800,000 tons were in Florida and 168,000 tons in Tennessee. In the Western States stocks on hand were very small. Stocks of wet phosphate rock in the United States were more than three times those of dry rock, and this ratio between wet and dry stocks likewise held for stocks in Florida. In Tennessee stocks of wet rock were more than twice those of dry rock.

Total stocks in hands of producers at the end of 1930 equaled nearly three months' average shipments. Stocks of dry rock on hand, however, were only about three-fourths of an average month's shipments.

REVIEW BY STATES

In comparison with 1929, there was increase in 1930 in both quantity and value of phosphate rock sold in Florida, Idaho, and Montana but decrease in both quantity and value in Tennessee and Wyoming. Florida's output increased 5.2 per cent in quantity and 9 per cent in value; sales of Idaho rock increased 66.9 per cent in quantity and 65.3 per cent in value; and Montana's output was many times the quantity and value of that in 1929. The average value of the phosphate rock sold in Florida increased 11 cents per ton over the 1929 average; the average value in Tennessee decreased 8 cents per ton from the 1929 average; and the average value in the Western States was 4 cents per ton less than in 1929.

Phosphate rock sold or used by producers in the United States, 1929 and 1930, by States

State	1929		1930	
	Long tons	Value	Long tons	Value
Florida:				
Hard rock	72, 424	$267, 218	81, 753	$517, 229
Land pebble and soft rock	3, 015, 874	9, 633, 856	3, 166, 318	10, 273, 076
	3, 088, 298	9, 901, 074	3, 248, 071	10, 790. 305
Tennessee: Brown and blue rock	633, 939	3, 097, 104	611, 045	2, 938, 525
Western States:				
Idaho	35, 899	141, 931	59, 932	234, 543
Montana	40	400	6, 005	27, 457
Wyoming	2, 679	12, 750	1, 339	6, 000
	3, 760, 855	13, 153, 259	3, 926, 392	13, 996, 830

FLORIDA

Florida holds first place in the United States as a producer of phosphate rock and has occupied this position continuously since 1894, when it took the lead from South Carolina. It was the source of 82.7 per cent of the total phosphate rock sold or used by producers in the United States in 1930. The upward movement in production that began in 1928, after declines in the two previous years, continued into 1930. The increase over 1929 was 5.2 per cent in quantity and 9 per cent in total value. The average value of $3.32 per ton in 1930 was 11 cents more than the average in 1929.

Land-pebble phosphate rock constituted 97.5 per cent of the total quantity of Florida phosphate rock marketed or used by producers in 1930, and hard-rock phosphate comprised the remaining 2.5 per cent.

The general trend of hard-rock production has been downward since 1907. In 1927 there was a slight reaction upward, but in 1928 the downward trend was again resumed and continued into 1929. In 1930, however, the quantity and value of hard rock marketed increased 12.9 and 93.6 per cent, respectively, in comparison with 1929. The average value of the hard rock (dried), f. o. b. shipping point, has been calculated at $6.33 per ton in 1930. The increase in average value per ton over 1929 is partly attributed to the fact that in 1930 the total value represents, as far as possible, dry rock, f. o. b. shipping point, whereas in 1929 a portion of the production was valued on a wet-rock basis at the mines. The average export value of high-grade rock in 1930, calculated from statistics of the Bureau of Foreign and Domestic Commerce, was $6.78.

The hard-rock deposits worked are in northwestern peninsular Florida near Hernando, Inverness, and Dunnellon and about 100 miles north of the land-pebble field. In mining these deposits the overburden is stripped by hydraulic methods and the hard-rock matrix is mined by dipper dredges, with 1½-cubic yard buckets, operating in artificial ponds. The matrix is hauled by cable over trestles in 1-bucket-capacity cars to the washers on the edge of the pits, where the hard-rock phosphate is separated. The greater part of the washed product is shipped to Fernandina, on the east coast of Florida, where it is dried and shipped, mostly to European ports.

The following companies marketed hard rock in 1930.

J. Buttgenbach & Co., Dunnellon. Pits at Dunnellon and Hernando.
C. & J. Camp, Ocala. Pits near Dunnellon.
Mutual Mining Co., Savannah, Ga. Pits near Inverness.
J. D. Robertson, Ocala. Pits near Inverness.

Mining operations were in progress in 1930 at the properties of J. Buttgenbach & Co. and the Mutual Mining Co. C. & J. Camp and J. D. Robertson did no mining in 1930 but shipped from stock. Most of the product was exported, but two of the companies sold hard rock in 1930 in the domestic market.

Land-pebble phosphate rock constituted 97.5 per cent of the total Florida production in 1930, compared with 97.7 per cent in 1929. The marketed production in 1930 increased 5 per cent in quantity and 6.6 per cent in total value over 1929. The average value f. o. b. mines, according to reports from the various producers, was $3.24 per ton in 1930, 5 cents higher than in 1929. The marketed production of 3,166,318 long tons in 1930 was the largest land-pebble output ever reported, surpassing the record of 1929. Land-pebble exports in 1930 were the greatest since 1913, the first year for which separate official figures for exports of land pebble were recorded; they constituted nearly 35 per cent of the 1930 marketed production of land-pebble phosphate rock.

The Florida land-pebble area of Polk and Hillsborough Counties remains by far the largest individual phosphate rock-producing district in the United States. The deposits are flat-lying unconsolidated sediments of Pliocene or later age, reconcentrations from the marine-planated phosphate-bearing Miocene limestone bedrock. The phosphate-bearing material, known locally as "matrix," variable in quantity and thickness, is overlain by variable thicknesses of sand or clay. The overburden is stripped either by drag-line excavators or by hydraulic methods. The matrix is mined entirely by hydraulicking. The material is washed down into sumps dug in the bedrock and is then pumped to washing plants near the pits. The concentrated wet phosphate rock from these washers is transported to the drying plants, where, after partial drying by drainage in wet storeag piles, it is dried further in oil-fired direct-heat rotary driers. One company, the International Agricultural Corporation, used a flotalotn process in the recovery of finely divided phosphate in 1930.

In 1930 several companies reported production of land-pebble phosphate rock, as follows:

Amalgamated Phosphate Co., 535 Fifth Avenue, New York, N. Y. Pits near Brewster.

The American Agricultural Chemical Co., 420 Lexington Avenue, New York N. Y. Pits near Brewster, Pierce, and Plant City.

Coronet Phosphate Co., 99 John Street, New York, N. Y. Pits near Mulberry and at Pembroke and Plant City.

International Agricultural Corporation, 61 Broadway, New York, N. Y. Pits near Mulberry.

The Phosphate Mining Co., 110 William Street, New York, N. Y. Pits near Bartow, Christina, and Nichols.

Southern Phosphate Corporation, Baltimore Trust Building, Baltimore, Md. Pits at Eaton Park and Lakeland.

Swift & Co., Union Stock Yards, Chicago, Ill. Pits near Fort Meade.

A few thousand tons of soft rock have been included with the land-pebble statistics. This material is mined at Bartow, in the land-pebble district, by the Lakeland Phosphate & Fertilizer Co. of Bartow and is dried, ground, and shipped for use as fertilizer filler and, to a limited extent, for direct application to soil.

Investigations of methods of concentration of the phosphatic sands of the land-pebble field were carried on from 1927 to 1930 by the United States Bureau of Mines in cooperation with certain Florida phosphate-rock companies, the Missouri School of Mines and Metallurgy, and the University of Alabama. The results of this research work are published in reports of the Bureau of Mines.[3]

Florida phosphate rock sold or used by producers, 1921–1930

Year	Hard rock			Soft rock		
	Long tons	Value at mines		Long tons	Value at mines	
		Total	Average		Total	Average
1921	175,774	$1,806,671	$10.28	4,419	$20,153	$4.56
1922	188,084	1,308,201	6.96	446	3,500	7.85
1923	199,516	1,071,675	5.37	----------	----------	----------
1924	143,115	629,579	4.40	----------	----------	----------
1925	171,649	707,933	4.12	----------	----------	----------
1926	116,264	465,308	4.00	----------	----------	----------
1927	131,254	525,016	4.00	----------	----------	----------
1928	95,918	383,672	4.00	----------	----------	----------
1929	72,424	267,218	3.69	([a])	([a])	([a])
1930	81,753	517,229	6.33	([a])	([a])	([a])

Year	Land pebble			Total		
	Long tons	Value at mines		Long tons	Value at mines	
		Total	Average		Total	Average
1921	1,599,835	$8,604,818	$5.38	1,780,028	$10,431,642	$5.86
1922	1,870,063	7,035,821	3.76	2,058,593	8,347,522	4.05
1923	2,348,137	7,987,752	3.40	2,547,653	9,059,427	3.56
1924	2,289,466	7,387,897	3.23	2,432,581	8,017,476	3.30
1925	2,758,315	8,081,137	2.93	2,929,964	8,789,070	3.00
1926	2,591,943	8,218,200	3.17	2,708,207	8,683,508	3.21
1927	2,506,166	8,121,146	3.24	2,637,420	8,646,162	3.28
1928	2,787,528	9,040,350	3.24	2,883,446	9,424,022	3.27
1929	[a] 3,015,874	[a] 9,633,856	[a] 3.19	3,088,298	9,901,074	3.21
1930	[a] 3,166,318	[a] 10,273,076	[a] 3.24	3,248,071	10,790,305	3.32

[a] Soft rock included with land pebble.

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[3] Lawrence, H. M., and De Vaney, F. D., Flotation of Low-Grade Phosphate Ores: Rept. of Investigations 2860, Bureau of Mines, 1928, 4 pp.

Lawrence, H. M., Losses of Phosphate in the Land-Pebble District of Florida: Rept. of Investigations 2925, Bureau of Mines, 1929, 5 pp.

Lawrence, H. M., and O'Meara, R. G., Gravity Concentration on Certain Florida Phosphatic Sands: Rept. of Investigations 3018, Bureau of Mines, 1930, 8 pp.

Lawrence, H. M., Increased Recoveries of Phosphate in the Land-Pebble District of Florida: Rept. of Investigations 3023, Bureau of Mines, 1930, 9 pp.

Lawrence, H. M., and Roca, E., Flotation of Low-Grade Phosphate Ores—II: Rept. of Investigations 2105, Bureau of Mines, 1931, 9 pp.

O'Meara, R. G., Added Recovery by Hydraulic Sizing of Fine Material in the Land-Pebble District of Florida: Rept. of Investigations 3129, Bureau of Mines, 1931, 5 pp.

Quotations for Florida land-pebble phosphate rock at the end of 1930 are given in the following table. The rapid rise in the prices of phosphate rock from the lower to the higher grades is related not only to the increased total content of tricalcium phosphate (known to industry as "B. P. L." or "bone phosphate of lime") but reflects also an increased value per unit of tricalcium phosphate in the higher grades.

Prices of pebble phosphate per long ton, Florida [4]

Export prices (f. a. s.):		Domestic prices (f. o. b.):	
76 to 77 per cent	$7. 15	76 to 77 per cent	$6. 50
75 per cent	6. 40	74 to 75 per cent	5. 50
74 to 75 per cent	6. 15	72 per cent	4. 50
70 per cent	4. 65	70 per cent	4. 00
68 per cent	4. 10		

TENNESSEE

Tennessee is the second largest producer of phosphate rock, ranking next to Florida, and has maintained this position since it surpassed South Carolina in production in 1899. The phosphate deposits at present worked are in the west-central part of the State. Two types of rock are now mined—"brown phosphate rock" and "blue phosphate rock." The brown phosphate rock is the residual weathered and leached outcrop of the phosphatic Ordovician limestones exposed over a wide area in the southern part of the central basin of Tennessee, where erosion of that basin in the summit of the Nashville dome has exposed the underlying Ordovician phosphatic limestones to weathering. The so-called blue phosphate rock is a thin, unweathered, highly phosphatic stratum of Devonian or Carboniferous (Mississippian) age occurring in the western part of the phosphate region.

The overburden of the brown phosphate rock is clay and is removed at the larger operations with drag-line excavators. The rock itself is mined by drag-line excavators whenever possible. Where the phosphate is thin or lies in narrow channels ("cutters") in the limestone and can not be mined by the drag-line excavators it is mined by pick and shovel. Steam shovels and hydraulic methods are no longer used for stripping or mining. The blue rock is mined by underground methods—drift mining by single-entry room-and-pillar system.

Most of the brown rock mined is washed later. Lump phosphate rock suitable for furnace use is either removed in the course of hand mining or is taken out by screens in the early stages of washing. The first step in the washing process is to disintegrate the material by thorough agitation (usually in log washers) with water. After all the clay and fine sand are in suspension the coarser phosphatic material is removed by screening. The next step is to separate the finer phosphatic grains from the clay in mechanical or hydraulic classifiers. Flotation is being introduced for the recovery of phosphate rock formerly wasted. The excess moisture in the wet rock from the washers is allowed to drain off in outdoor storage piles, and the product is dried further in coal-fired direct-heat rotary driers.

The blue phosphate rock requires only crushing and drying before shipment.

The quantity of phosphate rock sold or used by producers in Tennessee in 1930 (611,045 long tons) was, with only three exceptions

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[4] Engineering and Mining Journal, Metal and Mineral Markets: Vol. 2, No. 2 Jan. 8, 1931, p. 7.

(1907, 1920, and 1929), the highest in the history of the State's phosphate rock-mining industry. In comparison with 1929 the 1930 output decreased only 3.6 per cent in quantity and 5.1 per cent in value. By far the greater part of the present Tennessee production comes from the brown-rock fields; the remainder is blue rock obtained from the Mayfield mine at Gordonsburg.

In 1930, 10 phosphate rock-mining producers were operating in Tennessee, as follows:

The American Agricultural Chemical Co., 420 Lexington Avenue, New York, N. Y. Brown-rock pits at Spring Hill.

Armour Fertilizer Works, 111 West Jackson Boulevard, Chicago, Ill. Brown-rock pits near Columbia.

Charleston Mining Co., 627 East Main Street, Richmond, Va. Blue-rock mine at Gordonsburg and brown-rock pits at Mountpleasant.

Federal Chemical Co., Fourth Street and Broadway, Louisville, Ky. Brown-rock pits at Century, Ridley, and Southport.

W. T. Hackney, Mountpleasant.

Harsh Phosphate Co., R. F. D. 7, East Station, Nashville. Brown-rock pit near Nashville.

Hoover & Mason Phosphate Co., 8 South Michigan Avenue, Chicago, Ill. Brown-rock pits at Mountpleasant.

International Agricultural Corporation, 61 Broadway, New York, N. Y. Brown-rock pits at Mountpleasant and Wales.

J. J. Jones, Mountpleasant. Brown-rock pits at Mountpleasant.

Tennessee-Illinois Phosphate Co., 137 South La Salle Street, Chicago, Ill. Brown-rock pits at Twomey.

Tennessee phosphate rock sold or used by producers, 1921–1930

Year	Brown rock			Blue rock			Total		
	Long tons	Value at mines		Long tons	Value at mines		Long tons	Value at mines	
		Total	Average		Total	Average		Total	Average
1921	238,996	$1,574,621	$6.59	25,163	$146,198	$5.81	264,159	$1,720,819	$6.51
1922	329,949	1,951,539	5.91	9,078	51,803	5.71	339,027	2,003,342	5.91
1923	414,792	2,249,393	5.42	919	5,647	6.14	415,711	2,255,040	5.42
1924	367,319	1,894,422	5.16	21,378	81,766	3.82	388,697	1,976,188	5.08
1925	[1] 464,240	[1] 2,334,995	[1] 5.03	(1)	(1)	(1)	464,240	2,334,995	5.03
1926	[1] 455,395	[1] 1,980,613	[1] 4.35	(1)	(1)	(1)	455,395	1,980,613	4.35
1927	[1] 481,769	[1] 2,318,785	[1] 4.81	(1)	(1)	(1)	481,769	2,318,785	4.81
1928	[1] 577,095	[1] 2,856,850	[1] 4.95	(1)	(1)	(1)	577,095	2,856,850	4.95
1929	[1] 633,939	[1] 3,097,104	[1] 4.89	(1)	(1)	(1)	633,939	3,097,104	4.89
1930	[1] 611,045	[1] 2,938,525	[1] 4.81	(1)	(1)	(1)	611,045	2,938,525	4.81

[1] Blue rock included with brown rock.

WESTERN STATES

In 1930 the growth of the phosphate-rock industry in the Western States turned sharply upward, due to a large increase in the output of the leading producer, the Anaconda Copper Mining Co., and to the advent of one new producer in Idaho and two in Montana in response to the newly created demand for phosphate rock for superphosphate manufacture in British Columbia. The Western States usually furnish between 1 and 2 per cent of the total marketed production of the United States. In 1930 they supplied 2 per cent of the total.

The total quantity of phosphate rock sold or used by the producers in the Western States in 1930 was 67,276 long tons, an increase of 74.2 per cent over the preceding year. Increases were registered in both Idaho and Montana. Idaho marketed 59,932 tons in 1930.

compared with 35,899 tons in 1929. Commercial production in Montana was 6,005 tons in 1930, compared with 40 tons in 1929. Production in Wyoming decreased 50 per cent. The average value per ton of the rock sold in 1930 decreased to $3.98, a loss of 4 cents as compared with 1929.

The total quantity marketed by the Western States in 1930 (67,276 tons) was only 7.4 per cent under the maximum annual output of 72,631 tons in 1925.

Western States phosphate rock sold or used by producers, 1921–1930

Year	Long tons	Value at mines		Year	Long tons	Value at mines	
		Total	Average			Total	Average
1921	6, 291	$25, 872	$4. 11	1926	37, 577	$162, 020	$4. 31
1922	4, 481	19, 692	4. 39	1927	51, 510	288, 405	5. 60
1923	30, 335	175, 713	5. 79	1928	40, 865	162, 307	3. 97
1924	38, 570	194, 569	5. 04	1929	38, 618	155, 081	4. 02
1925	72, 631	319, 498	4. 40	1930	67, 276	268, 000	3. 98

Five phosphate rock-producing companies were operating in the Western States in 1930—2 in Idaho, 2 in Montana, and 1 in Wyoming. They were as follows:

Anaconda Copper Mining Co. (fertilizer department), Conda, Caribou County, Idaho.

Solar Development Co. (Ltd.), Trail, British Columbia, Canada. Mine near Paris, Bear Lake County, Idaho.

Dissett Bros., Philipsburg, Mont. Mine near Philipsburg, Granite County, Mont.

Montana Phosphate Products Co., Garrison, Mont. Mine near Garrison, Powell County, Mont.

Cokeville Phosphate Co., Cokeville, Lincoln County, Wyo.

The western phosphate-rock deposits are oolitic phosphatic marine strata of Permian age. The productive beds are thick—5 feet or more—and carry at least 30 per cent of phosphoric acid. The phosphate rock is mined by underground methods. The freshly mined rock is relatively dry, but some of the producers run it through a dryer before shipping. It is being used chiefly in the manufacture of superphosphates. The larger portion of the production—that from the Anaconda Copper Mining Co. phosphate mine at Conda, Idaho—is shipped to Anaconda, Mont., where it is made into treble superphosphate, phosphoric acid, and ammonium phosphate; a small part of the production from this property is ground for direct application to soil. The Solar Development Co. (Ltd.), a new producer in Idaho, began operations in November, 1930, at the Star mine in Bear Lake County near Paris. The rock produced was shipped to Canada for the manufacture of superphosphates. Two new operators in Montana—Dissett Bros., Philipsburg, and the Montana Phosphate Products Co., Garrison—produced the total marketed output of the State in 1930. Dissett Bros. operated the Red Hill mine (nearest post office, Philipsburg), and the Montana Phosphate Products Co. operated the Anderson mine (nearest post office, Garrison, Powell County). The total output was shipped to Canada for the manufacture of superphosphates. The product of the Cokeville Phosphate Co., Cokeville, Wyo., was used for direct application to soil.

OTHER STATES

Phosphate-rock deposits in the United States in the Carolinas, Kentucky, Arkansas, and other States have recently been unproductive. Kentucky and South Carolina, which have been the more important of these States, ceased producing in 1926 and 1925, respectively. The record of production for the past 10 years is given in the following table.

Kentucky and South Carolina phosphate rock sold or used by producers, 1921–1930 [1]

Year	Kentucky			South Carolina		
	Long tons	Value at mines		Long tons	Value at mines	
		Total	Average		Total	Average
1921	13,547	$91,737	$6.77			
1922	14,282	104,040	7.28	1,500	$8,250	$5.50
1923	13,007	85,869	6.60			
1924	7,941	63,850	8.04			
1925	12,837	94,064	7.33	2,147	8,051	3.75
1926	8,797	67,659	7.69			

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[1] No production reported for 1927 to 1930.

IMPORTS

The relatively small quantities of phosphatic materials imported into the United States are of four principal types: Phosphate rock from Pacific islands into Hawaii, from French Morocco into Eastern United States, and from Cuba into Porto Rico; bone products assembled from many foreign countries; guano; and basic slag.

In 1930 the crude phosphate rock imported decreased 12,241 long tons (27.3 per cent) and $91,994 (19.6 per cent) from 1929. Seventy-eight per cent of the phosphate rock imported in 1930 came from French possessions. Imports from French Morocco entered Eastern United States (Baltimore) to the amount of 6,000 tons in 1930, 10,400 tons (63.4 per cent) less than in 1929. Imports from French Oceania into the Hawaiian Islands in 1930 were 19,417 tons, compared with 19,348 tons in 1929. Imports from Cuba into Porto Rico in 1930 were 6,360 tons, a slight increase over 1929.

Imports of basic slag and guano decreased, whereas those of the bone-dust group increased slightly.

In 1928 the antidumping law was invoked with respect to imports of phosphate rock from French Morocco, but the decision of the customs authorities was not upheld after a series of legal actions. The phosphate rock in question was entered at Baltimore between July 18, 1927, and January 19, 1928, at invoice prices ranging from $6.50 to $7 per ton, less freight which ranged from $2.05 to $2.50 per ton. The Baltimore customs appraiser fixed the foreign value at $7.52 per ton and consequently applied the antidumping law. From this judgment of the appraiser an appeal was taken and heard by a single judge of the United States Customs Court at Baltimore; at this hearing the foreign market value, based on sales by the governmental agency in Morocco to farmers, cooperative societies, and manufacturers in that country, was fixed at $3.98 per ton. The court held that sales by the Government in the home market (purchasers being prohibited from exporting the article) created a foreign market value within the meaning of the act, and the entered value was sustained. Judgment was entered accordingly on March 29, 1929. (T. D. 43,306.) An appeal was taken from this judgment to the Third Division of the United States Customs Court, which affirmed the judgment of the trial judge. (Circ. 1478.) Appeal was taken from this judgment to the Court of Customs and Patent Appeals, which reversed the judgment of the Third Division (United States *v.* J. H. Cottman & Co., 18 C. C. P. A.—T. D. 44,095) on one item, namely, that the trial court erred in not admitting certain evidence. The cause was thereby remanded to the lower court for a new trial. The evidence referred to was admitted at the new trial of the action; on January 27, 1931, the presiding judge in the United States Customs Court, reviewing the court's earlier reversal of the Baltimore customs appraiser's finding that Moroccan phosphate rock was being dumped in the United States, ruled that there was no dumping in the case at bar. (T. D. 44,581.)

Phosphate rock, crude, imported into the United States, 1926–1930, by countries

[General imports]

Country	1926		1927		1928		1929		1930	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
Belgium	13	$1,120	--------	--------	--------	--------	--------	--------	--------	--------
Canada	624	15,057	116	$3,222	104	$3,284	741	$14,144	830	$16,278
Cuba	4,239	37,362	--------	--------	11,752	141,544	6,000	73,972	6,360	72,797
France	--------	--------	--------	--------	(1)	5	--------	--------	--------	--------
Germany	(1)	6	45	1,115	--------	--------	--------	--------	--------	--------
Japan	--------	--------	2	44	--------	--------	--------	--------	--------	--------
Morocco, French	--------	--------	10,641	48,635	20,572	103,199	16,400	96,102	6,000	30,000
Netherlands	--------	--------	--------	--------	--------	--------	160	2,060	--------	--------
Oceania:										
British	2	21	--------	--------	--------	--------	--------	--------	--------	--------
French	10,000	116,000	17,391	239,855	13,371	183,170	19,348	261,411	19,417	257,742
Soviet Russia in Europe	--------	--------	--------	--------	--------	--------	--------	--------	51	360
United Kingdom	2,500	23,045	--------	--------	--------	--------	--------	--------	--------	--------
West Indies: Netherland	--------	--------	--------	--------	13	36	2,250	21,482	--------	--------
	17,378	192,611	28,195	292,871	45,812	431,238	44,899	469,171	32,658	377,177

[1] Less than 1 ton.

Phosphatic fertilizers (other than crude phosphate rock) imported for consumption in the United States, 1926–1930

Fertilizer	1926		1927		1928		1929		1930	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
Bone dust, or animal carbon, and bone ash, fit only for fertilizing	46,715	$1,380,103	54,586	$1,540,897	82,460	$2,566,686	55,877	$1,624,483	59,680	$1,474,500
Guano	11,673	430,203	23,321	898,205	22,584	1,046,834	45,905	2,202,709	40,431	1,655,886
Slag, basic, ground or unground	269	3.485	1,625	18,945	2,822	31,879	3,998	54,456	3,913	54,463

EXPORTS

PHOSPHATE ROCK

The general trend of the total annual export tonnages of phosphate rock from the United States since 1921 has been upward at an increasing rate. Total exports in 1930 (1,225,722 long tons) accounted for 31 per cent of the 1930 total marketed production of domestic phosphate rock and were greater than in any year since 1913, when 1,366,508 tons were exported. Exports increased 7 per cent in quantity over 1929. The advance in the exports of land-pebble phosphate rock far more than compensated for the decline in the tonnage of high-grade hard rock exported. The total value of the exports was $5,630,547, an increase of $243,628 (4.5 per cent) over 1929. The total quantity and value of the high-grade hard rock exported in 1930 were lower than in 1929, but land-pebble exports increased 7.9 per cent in quantity and 5.5 per cent in value.

Shipments of phosphate rock to Europe in 1930 amounted to 878,306 tons (72 per cent of the total exports) and represented an increase of 15,324 tons over 1929. Asia took 288,775 tons or 23 per cent of the total exports in 1930, North America 57,695 tons or 5 per cent, and Oceania less than 1 per cent.

Germany was the best customer of the phosphate-rock industry of the United States in 1930, taking 297,199 tons or 24 per cent of the total tonnage exported from the United States, the same percentage as in 1929. Of this amount 15,652 tons were high-grade hard rock, and 281,547 tons were land-pebble phosphate. Japan ranked second, taking 287,372 tons (all land pebble), or 23.4 per cent of the total exports. Netherlands stood third with 13.8 per cent, Italy fourth with 7.8 per cent, and Sweden fifth with 5.9 per cent.

High-grade hard-rock exports continued the irregular decline which started from the postwar peak of 1920 and were at the lowest level since 1918. Shipments of high-grade hard rock in 1930 (65,992 tons) decreased 2.2 per cent from the 1929 exports. Europe remains the leading market for high-grade hard rock, taking 95 per cent of the total high-grade hard rock exported from the United States in 1930; these shipments were all to northwestern Europe. North America (Canada and Panama) took 3 per cent of the total, and Oceania about 2 per cent. Shipments to Germany, Netherlands, Norway, Poland and Danzig, and Canada decreased; shipments to Australia, Belgium, Lithuania, and Sweden increased.

The quantity of land pebble and "other" phosphate rock exported in 1930 reached a new postwar record (1,159,730 tons); it was also the highest since 1913, the first year for which separate official figures for land-pebble exports were recorded. The 1930 exports exceeded those of 1929 by 84,458 tons (7.9 per cent). Exports to Canada, Germany, India (British), Irish Free State, Japan, Mexico, Netherlands, Sweden, United Kingdom, and Yugoslavia and Albania increased; exports to Belgium, China, Cuba, Denmark, France, Italy, Latvia, Lithuania, Poland and Danzig, and Spain declined.

Seventy per cent of the land pebble exported went to Europe, 25 per cent to Asia, and 5 per cent to North American countries. Japan was the leading land-pebble phosphate-consuming country and took 24.8 per cent of the total exports of this product. Germany was a close second, taking 24.3 per cent, and was followed by Netherlands and Italy.

Phosphate rock, ground or unground, exported from the United States, 1921–1930

Year	High-grade rock		Land pebble		Other		Total	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
1921	182, 594	$2, 592, 541	544, 425	$4, 627, 875	6, 293	$99, 721	733, 312	$7, 320, 137
1922	202, 300	2, 548, 587	512, 777	3, 269, 179	4, 217	40, 401	719, 294	5, 858, 167
1923	194, 339	2, 477, 501	630, 565	3, 273, 006	2, 647	21, 664	827, 551	5, 772, 171
1924	150, 746	1, 814, 194	656, 005	3, 209, 965	12, 022	96, 673	818, 773	5, 120, 832
1925	158, 985	2, 283, 076	697, 891	3, 287, 370	13, 324	107, 317	870, 200	5, 677, 763
1926	103, 572	1, 195, 729	634, 362	3, 155, 732	11, 029	84, 129	748, 963	4, 435, 590
1927	128, 774	888, 732	[1] 789, 437	[1] 3, 842, 830	(1)	(1)	918, 211	4, 731, 562
1928	89, 702	615, 682	[1] 809, 062	[1] 3, 837, 419	(1)	(1)	898, 764	4, 453, 101
1929	67, 474	473, 031	[1] 1, 075, 272	[1] 4, 913, 888	(1)	(1)	1, 142, 746	5, 386, 919
1930	65, 992	447, 432	[1] 1, 159, 730	[1] 5, 183, 115	(1)	(1)	1, 225, 722	5, 630, 547

[1] "Other" included with land pebble; not separately recorded.

Phosphate rock, ground or unground, not acidulated, exported from the United States, 1926–1930, by countries

HIGH-GRADE ROCK

Country	1926		1927		1928		1929		1930	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
Australia	12, 500	$187, 500	------	------	------	------	------	------	946	$10, 406
Belgium	16, 125	219, 275	11, 950	$81, 820	9, 000	$63, 000	7, 100	$48, 700	14, 930	97, 145
Canada	2, 443	10, 784	1, 145	6, 747	3, 559	26, 488	3, 140	25, 517	2, 187	21, 237
France	------	------	1, 050	7, 350	------	------	------	------	------	------
Germany	23, 525	232, 775	94, 725	653, 495	49, 318	331, 419	21, 936	153, 831	15, 652	107, 539
Lithuania	------	------	------	------	------	------	------	------	8, 400	54, 600
Mexico	4	70	------	------	------	------	3	43	------	------
Netherlands	12, 175	152, 225	3, 550	24, 850	11, 425	79, 975	10, 465	72, 605	4, 125	28, 087
New Zealand	12, 625	136, 575	------	------	------	------	------	------	------	------
Nicaragua	------	------	4	20	------	------	------	------	------	------
Norway	2, 100	36, 500	4, 200	29, 400	2, 100	14, 700	2, 200	15, 400	------	------
Panama	------	------	------	------	------	------	------	------	2	43
Poland and Danzig	8, 775	106, 925	12, 150	85, 050	3, 600	25, 200	9, 500	66, 500	------	------
Sweden	13, 300	113, 100	------	------	10, 700	74, 900	13, 130	90, 435	19, 750	128, 375
	103, 572	1, 195, 729	128, 774	888, 732	89, 702	615, 682	67, 474	473, 031	65, 992	447, 432

LAND PEBBLE [1]

Country	1926		1927		1928		1929		1930	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
Australia	36, 236	$227, 257	27, 332	$165, 492	------	------	------	------	------	------
Belgium	43, 551	220, 443	20, 716	104, 186	25, 492	$128, 313	29, 102	$141, 765	16, 705	$85, 522
British South Africa	13, 513	75, 297	10, 380	59, 685	------	------	------	------	------	------
Canada	14, 060	74, 832	17, 848	104, 173	18, 666	119, 519	25, 244	192, 222	45, 561	303, 410
China	------	------	------	------	------	------	3, 599	12, 597	------	------
Cuba	14, 529	70, 754	21, 754	106, 773	12, 157	65, 108	17, 196	77, 702	9, 901	54, 449
Czechoslovakia	------	------	------	------	3, 000	15, 300	------	------	------	------
Denmark	69, 868	362, 541	43, 755	193, 224	15, 947	73, 721	35, 287	161, 660	28, 991	126, 991
Estonia	------	------	------	------	------	------	3, 600	12, 600	------	------
Finland	------	------	9, 269	50, 426	------	------	------	------	------	------
France	------	------	------	------	------	------	2, 200	6, 622	1, 502	4, 806
Germany	65, 559	338, 440	125, 661	693, 367	166, 931	803, 549	246, 748	1, 110, 183	281, 547	1, 216, 147
India (British)	------	------	------	------	------	------	------	------	1, 403	5, 261
Irish Free State	------	------	------	------	------	------	------	------	10, 456	44, 653
Italy	86, 927	439, 382	87, 612	409, 193	96, 256	513, 526	122, 224	589, 656	96, 169	464, 181
Japan	95, 809	343, 473	131, 137	480, 780	183, 815	656, 839	230, 548	827, 316	287, 372	1, 051, 927
Latvia	------	------	12, 139	63, 198	12, 206	62, 885	16, 228	75, 957	4, 150	20, 211
Lithuania	------	------	------	------	3, 994	24, 963	7, 510	44, 060	3, 142	8, 852
Mexico	------	------	------	------	1	14	2	41	44	725
Netherlands	65, 373	330, 904	127, 981	606, 491	129, 035	636, 641	162, 224	787, 384	164, 562	760, 487
New Zealand	6, 162	33, 891	------	------	------	------	------	------	------	------
Poland and Danzig	3, 139	19, 776	25, 204	155, 943	22, 337	128, 097	39, 129	217, 644	36, 999	203, 053
Salvador	------	------	------	------	------	------	32	1, 765	------	------
Soviet Russia in Europe	------	------	------	------	------	------	4, 000	23, 000	------	------
Spain	94, 522	518, 802	72, 363	369, 350	76, 051	369, 328	76, 818	374, 946	64, 984	321, 162
Sweden	5, 839	32, 115	29, 794	175, 466	29, 160	178, 921	32, 325	161, 631	52, 853	277, 052
United Kingdom	19, 275	67, 825	26, 492	105, 083	7, 739	29, 020	9, 677	38, 744	29, 615	114, 768
Yugoslavia and Albania	------	------	------	------	6, 275	31, 675	11, 579	56, 393	23, 774	119, 458
	634, 362	3, 155, 732	789, 437	3, 842, 830	809, 062	3, 837, 419	1, 075, 272	4, 913, 888	1, 159, 730	5, 183, 115

[1] Classification beginning 1927 reads "Land pebble and other"; not separately recorded.

Phosphate rock, ground or unground, not acidulated, exported from the United States, 1926–1930, by countries—Continued

ALL OTHER PHOSPHATE ROCK[1]

Country	1926		1927		1928		1929		1930	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
Belgium	500	$2,000	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Canada	6,649	61,301								
Dominican Republic	60	200								
Netherlands	3,820	20,628								
	11,029	84,129	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)

[1] Classification beginning 1927 reads "Land pebble and other"; not separately recorded.

SUPERPHOSPHATES AND OTHER FERTILIZER MATERIALS

The quantity of superphosphates exported in 1930 was the largest recorded in the past decade and showed an increase of 31 per cent over exports in 1929; the value exceeded that of 1929 by 7 per cent. Most of the superphosphates exported went to three destinations—Canada, Cuba, and Java and Madura—Canada taking 95 per cent of the total.

Superphosphates (acid phosphates) exported from the United States in 1930, by countries

Country	Long tons	Value
Canada	105,817	$1,424,069
Cuba	3,669	70,039
Java and Madura	1,119	51,334
Other	1,054	50,008
	111,659	1,595,450

The following table shows the exports of superphosphates and the export movement of other types of fertilizer materials during the past 10 years.

Fertilizers exported from the United States, 1921–1930

Year	Superphosphates (acid phosphates)		Prepared fertilizer mixtures		Nitrogenous fertilizer materials				All other fertilizers	
					Sulphate of ammonia		Other			
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
1921	4,278	$96,303	(1)	(1)	(1)	(1)	(1)	(1)	55,239	$2,602,277
1922	26,781	372,279	14,416	$690,972	147,331	$8,736,611	[2] 4,219	[2] $110,386	25,462	898,061
1923	42,099	534,446	17,997	832,948	153,677	11,117,726	13,291	614,814	45,073	1,921,972
1924	45,751	588,620	35,793	1,695,472	118,367	6,918,598	4,699	283,154	44,942	1,901,722
1925	65,779	988,914	29,923	1,530,354	123,141	6,748,728	6,802	367,435	46,509	1,985,335
1926	64,452	937,278	26,439	1,009,402	181,125	9,823,847	9,639	566,306	72,164	3,267,562
1927	107,507	1,615,466	14,720	617,582	138,692	6,826,600	8,951	492,004	82,962	3,440,961
1928	88,613	1,510,577	26,414	936,111	93,015	4,373,162	7,772	323,909	104,260	4,497,949
1929	85,118	1,489,476	33,508	1,795,918	144,761	6,295,519	24,358	1,229,995	89,936	3,660,160
1930	111,659	1,595,450	36,459	1,477,155	81,662	2,909,616	25,552	1,158,870	55,289	1,869,310

[1] Not separately classified.

[2] Includes 2,556 tons of calcium cyanamid (lime of nitrogen), valued at $26,112; not separately classified for other years.

CONSUMPTION OF PHOSPHATE ROCK IN THE UNITED STATES

The table that accompanies this section shows the total annual apparent consumption of phosphate rock in the United States and the annual apparent consumption of domestic phosphate rock. There is comparatively little difference between the two sets of figures, as imports are as yet relatively small, the home demand being largely satisfied from domestic production.

The greatest annual consumption of phosphate rock in the United States was in 1920, when a total of 3,034,333 long tons of phosphate rock was apparently consumed. The depression of 1921 cut the consumption over one-half to 1,334,248 tons. After this depression the amount consumed annually increased rapidly until 1925, when it reached 2,614,354 tons. After dropping off slightly for two years, the apparent consumption advanced to 2,648,454 tons in 1928, to 2,663,008 tons in 1929, and to 2,733,328 tons in 1930.

Phosphate rock consumed in the United States, 1921–1930, in long tons

Year	Marketed production	Imports	Exports	Apparent consumption	
				Total [1]	Domestic rock [2]
1921	2, 064, 025	3, 535	733, 312	1, 334, 248	1, 330, 713
1922	2, 417, 883	5, 890	719, 294	1, 704, 479	1, 698, 589
1923	3, 006, 706	6, 725	827, 551	2, 185, 880	2, 179, 155
1924	2, 867, 789	16, 098	818, 773	2, 065, 114	2, 049, 016
1925	3, 481, 819	2, 735	870, 200	2, 614, 354	2, 611, 619
1926	3, 209, 976	17, 378	748, 963	2, 478, 391	2, 461, 013
1927	3, 170, 699	28, 195	918, 211	2, 280, 683	2, 252, 488
1928	3, 501, 406	45, 812	898, 764	2, 648, 454	2, 602, 642
1929	3, 760, 855	44, 899	1, 142, 746	2, 663, 008	2, 618, 109
1930	3, 926, 392	32, 658	1, 225, 722	2, 733, 328	2, 700, 670

[1] Marketed production plus imports minus exports.

[2] Marketed production minus exports.

WORLD PRODUCTION

On the basis of reports covering about 96 per cent of the tonnage, the world production of phosphate rock in 1930 is estimated at about 11,700,000 metric tons, or about 1,300,000 tons more than world production in 1929. Large increases in production were as follows: Tunisia 815,000 tons, French Morocco 170,759 tons, United States 168,194 tons, Algeria 99,651 tons, and Egypt 98,167 tons. The largest decrease was in the production of Nauru and Ocean Islands, where a drop of 73,579 tons in output was reported. Other important decreases were 66,915 tons in Makatea Island and 15,792 tons in Curacao.

All the French North African Colonies increased their production of phosphate rock in 1930, the total gain being 1,085,410 tons over the production in 1929. Production in French Morocco continued the rise begun in 1921, Tunisia recovered from the slump of 1928 and 1929 in production, and Algeria partly recovered from its recent decline.

France and its colonies, the United States, and the British Empire together produced 94 per cent of the world's production of phosphate rock in 1930. France and its colonies again led all other nations in phosphate-rock production, accounting for about 54 per cent of the world total in 1930 as compared with 51 per cent in 1929. The United States produced about 34 per cent in 1930 as compared with 37 per cent in 1929. The British Empire again produced about 6 per cent.

Of the individual countries in 1930, the United States was still the leading producer, exceeding Tunisia (second in output) by 663,411 metric tons, about half as large a margin as in 1929. French Morocco retained third place, with Algeria in fourth and Nauru and Ocean Islands in fifth.

World production of phosphate rock, 1926–1930, by countries, in metric tons

[Compiled by M. T. Latus, of the Bureau of Mines]

Country	1926	1927	1928	1929	1930
Algeria	929,355	919,108	875,947	747,035	846,686
Angaur Island [1]	63,922	64,141	65,358	65,494	(2)
Australia:					
New South Wales	257	132	138	71	26
South Australia	896	761	------	------	------
Victoria	122	------	------	------	(2)
Belgium	30,030	39,760	15,510	40,330	(2)
Canada	[3] 36	137	582	1,075	[3] 36
China	(2)	12,000	(2)	(2)	(2)
Christmas Island (Straits Settlements) [4]	131,057	118,553	113,687	119,756	121,858
Egypt	232,008	279,389	200,563	215,311	313,478
Estonia	4,054	3,576	6,858	8,352	4,850
France	252,168	217,400	219,200	189,000	(2)
Germany: Prussia [3]	542	443	------	------	------
India (British) [3]	730	613	818	22	308
Indo-China	14,511	20,700	19,629	18,772	30,300
Japan	108,569	75,386	58,776	14,573	(2)
Madagascar	6,135	6,480	8,450	13,441	11,150
Makatea Island [4]	127,177	135,666	136,306	242,990	176,075
Morocco, French	882,821	1,400,000	[5] 1,337,079	[5] 1,608,249	[5] 1,779,008
Nauru and Ocean Islands [6]	398,059	633,345	509,970	585,844	512,265
Netherland West Indies: Curacao [4]	106,807	108,881	104,194	103,289	87,497
New Caledonia	[4] 10,647	9,000	7,000	(2)	(2)
Norway [3]	343	------	------	------	(2)
Philippine Islands	7,512	705	1,550	1,492	(2)
Poland	380	17,614	20,311	39,294	40,000
Rumania	------	------	------	1,626	1,829
Russia [7]	72,516	56.460	121,711	[8] 45,000	(2)
Seychelles Islands [4]	6,935	11,329	15,408	12,789	15,977
Spain	5,656	4,202	7,897	7,626	5,400
Tunisia	2,568,000	3,075,000	2,789,000	2,511,000	3,326,000
United States (sold or used by producers)	3,261,496	3,221,589	3,557,604	3,821,217	3,989,411

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[1] Exports during fiscal year ended March 31 of year following that stated.

[2] Data not available.

[3] Apatite.

[4] Exports.

[5] Shipments, including exports as follows: 1928, 1,323,293 tons; 1929, 1,591,933 tons; 1930, 1,760,812 tons.

[6] Exports during fiscal year ended June 30 of year stated.

[7] Year ended Sept. 30.

[8] Powdered.

STONE[1]

By A. T. Coons

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SUMMARY OF PRODUCTION

The total stone sold or used by the producers in the United States in 1930 amounted to 126,996,340 short tons, valued at $178,948,611, a decrease of 10 per cent in quantity and 12 per cent in value from the output in 1929. All varieties of stone, except that classed as "miscellaneous" (including chiefly crushed stone for concrete, road metal, and railroad ballast), decreased in both quantity and value of output.

The tables in this report give the quantities sold or used by producers and the values f. o. b. at quarries and mills, so far as these are obtainable. The value of the stone sold by producers of dimension stone for construction, monumental, or memorial use, who operate mills in connection with their quarries, is reported according to the unit value received by the producer. In consequence, the total values listed include those for both rough and finished stone; however, the values of these products are separated in the tables showing production by States and uses for the different varieties of stone. Stone quarried and used by the producer is considered as sold and is included in the figures for sales. The figures do not, however, include the stone made into abrasives (such as grindstones, etc.), glass sand, lime, or cement and reported in terms of finished product. These products are considered in the Mineral Resources chapters on Abrasives, Sand and Gravel, Lime, and Cement. The total amount of limestone used for all purposes is estimated on page 360.

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[1] Work on manuscript completed September, 1931.

Stone sold or used by producers in the United States, 1921–1930, by kinds

[Quantities approximate]

Year	Granite		Basalt and related rocks (trap rock)		Marble		Limestone	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1921	4, 752, 180	$20, 592, 217	8, 524, 480	$11, 450, 899	315, 400	$8, 580, 416	45, 621, 000	$57, 749, 594
1922	5, 913, 120	21, 125, 869	10, 032, 900	12, 600, 611	427, 870	10, 534, 671	58, 928, 660	68, 397, 927
1923	7, 300, 130	29, 704, 796	10, 674, 470	13, 539, 648	562, 560	12, 863, 974	76, 701, 360	89, 620, 007
1924	6, 883, 860	28, 772, 161	11, 671, 500	14, 679, 523	516, 000	13, 302, 235	75, 894, 430	89, 868, 956
1925	8, 074, 200	30, 531, 347	11, 842, 110	14, 770, 042	564, 150	13, 882, 457	85, 649, 440	98, 008, 028
1926	9, 330, 390	32, 044, 523	12, 977, 740	15, 950, 302	563, 170	14, 167, 480	91, 887, 900	109, 252, 299
1927	10, 706, 740	35, 287, 206	13, 210, 570	17, 399, 949	600, 060	15, 625, 872	99, 662, 270	112, 439, 824
1928	9, 556, 500	33, 994, 527	15, 327, 760	19, 693, 945	579, 490	16, 402, 986	96, 864, 650	110, 231, 974
1929	10, 826, 730	34, 225, 110	14, 871, 780	18, 946, 197	553, 660	16, 545, 312	100, 686, 960	113, 906, 071
1930	10, 047, 430	30, 423, 853	14, 532, 250	17, 053, 031	477, 240	12, 905, 596	88, 741, 440	100, 002, 114

Year	Sandstone		Other stone [1]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1921	2, 640, 460	$6, 425, 339	1, 685, 220	$2, 163, 801	63, 538, 740	$106, 962, 266
1922	3, 388, 130	7, 521, 044	1, 520, 880	1, 886, 806	80, 211, 560	122, 066, 928
1923	4, 349, 270	9, 174, 706	3, 730, 870	4, 567, 110	103, 318, 660	159, 470, 241
1924	3, 894, 690	10, 142, 099	4, 323, 640	5, 105, 139	103, 184, 120	161, 870, 113
1925	4, 479, 330	10, 920, 016	5, 242, 140	6, 104, 902	115, 851, 370	174, 216, 792
1926	4, 978, 530	11, 149, 029	4, 758, 630	5, 744, 957	124, 496, 360	188, 308, 590
1927	5, 050, 600	10, 923, 035	7, 114, 890	6, 971, 336	136, 345, 130	198, 647, 222
1928	4, 716, 530	10, 498, 440	6, 824, 580	5, 998, 825	133, 869, 510	196, 820, 697
1929	5, 790, 200	11, 023, 981	8, 380, 250	8, 046, 091	141, 109, 580	202, 692, 762
1930	4, 594, 310	10, 285, 391	8, 603, 670	8, 278, 626	126, 996, 340	178, 948, 611

[1] Includes mica schist, conglomerate, argillite, various light-colored volcanic rocks, serpentine not used as marble, and such other stone as can not be properly classed in any of the main groups.

All the dominant stone products except rubble, riprap, and stone for miscellaneous uses decreased in quantity in 1930 as compared with 1929, and all except flagging declined in total value. The quarrymen in general reported poor demand, declines in prices, and sharp competition with cheaper materials. Many of the stone products are closely connected with other industrial enterprises, and the stone industry was therefore naturally influenced by the business depression in such enterprises as building construction and in the iron and steel, refractory, chemical, and other manufacturing industries.

Stone sold or used by producers in the United States, 1929 and 1930, by uses

Use	1929		1930	
	Quantity	Value	Quantity	Value
Building stone____cubic feet__	34, 761, 140	$43, 905, 123	30, 169, 270	$39, 111, 527
Approximate equivalent in short tons____	2, 647, 410	----------	2, 321, 650	----------
Monumental stone____cubic feet__	4, 410, 140	15, 848, 126	3, 517, 870	13, 157, 550
Approximate equivalent in short tons____	366, 230	----------	290, 720	----------
Paving blocks____number__	31, 849, 130	2, 942, 991	31, 586, 260	2, 669, 511
Approximate equivalent in short tons____	300, 360	----------	294, 560	----------
Curbing____cubic feet__	4, 054, 700	3, 843, 961	3, 358, 583	3, 176, 102
Approximate equivalent in short tons____	336, 360	----------	262, 170	----------
Flagging____cubic feet__	1, 129, 690	666, 987	1, 095, 780	705, 775
Approximate equivalent in short tons____	87, 750	----------	81, 680	----------
Rubble____short tons__	907, 810	1, 324, 681	1, 066, 590	921, 937
Riprap____do____	4, 212, 990	5, 030, 743	4, 292, 030	4, 739, 122
Crushed stone____do____	92, 721, 260	94, 387, 878	87, 110, 890	87, 554, 354
Furnace flux (limestone and marble)____do____	24, 393, 500	18, 034, 910	17, 090, 710	12, 362, 159
Refractory stone (ganister, mica schist, and dolomite)____short tons__	1, 558, 200	1, 807, 324	1, 197, 500	1, 406, 776
Agricultural limestone____do____	2, 654, 580	3, 764, 775	2, 542, 100	3, 309, 329
Manufacturing industries (limestone and marble) ____short tons__	7, 430, 750	6, 361, 201	6, 021, 200	5, 324, 274
Other uses____do____	3, 492, 380	4, 774, 062	4, 424, 540	4, 510, 195
Total (quantities approximate, in short tons)__	141, 109, 580	202, 692, 762	126, 996, 340	178, 948, 611

Building stone sold or used by producers in the United States, 1929 and 1930, by kinds

Kind	Rough				Finished				Total	
	Constructional		Architectural		Sawed [1]		Cut [1]			
	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value
1929										
Granite	3, 659, 800	$616, 713	1, 295, 990	$1, 207, 346	[1] 326, 250	[1] $692, 368	[1] 920, 230	[1] $5, 588, 937	6, 202, 270	$8, 105, 364
Basalt	487, 800	65, 462							487, 800	65, 462
Marble			769, 120	1, 747, 190	632, 840	1, 864, 474	1, 376, 840	8, 514, 052	2, 778, 800	12, 125, 716
Limestone	2, 242, 050	280, 564	6, 192, 550	3, 779, 639	4, 632, 040	4, 168, 063	4, 798, 060	12, 420, 991	17, 864, 700	20, 649, 257
Sandstone	3, 489, 220	320, 630	423, 470	332, 038	662, 040	842, 225	295, 940	1, 171, 421	4, 870, 670	2, 666, 314
Miscellaneous	2, 556, 900	293, 010							2, 556, 900	293, 010
	12, 435, 770	1, 576, 379	8, 681, 130	7, 066, 213	6, 253, 170	7, 567, 130	7, 391, 070	27, 695, 401	34, 761, 140	43, 905, 123
1930										
Granite	3, 522, 600	683, 191	902, 390	930, 329	[1] 406, 530	[1] 1, 090, 849	[1] 875, 450	[1] 5, 095, 913	5, 706, 970	7, 800, 282
Basalt	421, 420	73, 717							421, 420	73, 717
Marble			692, 520	1, 451, 315	474, 210	1, 336, 892	1, 304, 370	6, 287, 824	2, 471, 100	9, 076, 031
Limestone	1, 611, 700	194, 550	6, 134, 250	3, 278, 346	3, 627, 910	3, 309, 238	4, 308, 860	11, 753, 159	15, 682, 720	18, 535, 293
Sandstone	3, 247, 100	351, 929	733, 720	668, 995	576, 320	820, 650	396, 520	1, 554, 272	4, 953, 660	3, 395, 837
Miscellaneous	933, 400	230, 367							933, 400	230, 367
	9, 736, 220	1, 533, 745	8, 462, 880	6, 328, 985	5, 084, 970	6, 557, 629	6, 885, 200	24, 691, 168	30, 169, 270	39, 111, 527

[1] For granite, sawed stone corresponds to dressed stone for construction work (walls, foundations, bridges) and cut stone to architectural stone for high-class buildings.

Building stone.—Aggregate sales of building stone of all kinds decreased 13 per cent in quantity and 11 per cent in value in 1930 as compared with 1929. The decrease was general for all classes of building stone, but stone sold for rough construction showed the largest decrease in quantity (22 per cent). In the Bedford limestone district of Indiana, which produces about 40 per cent of the building stone used, production decreased 12 per cent, notwithstanding the use of this stone in many large Federal and other public buildings in 1930. Most of the other important districts producing building stone also reported decreased production, as may be seen in the quantity reported, by States, under the different varieties of stone.

Rubble and riprap.—In addition to the production of building stone as shown in the preceding table, a large quantity of stone is reported as used for construction in the form of rubble stone or irregularly shaped stone of all sizes. This stone is used for rough walls, foundations, and other rough construction work where the stone is embedded in mortar or plaster. It is not included, however, with the figures for regular building stone. The quantity of this class of stone reported for 1930 increased 17 per cent over that in 1929, while the total value decreased 30 per cent. In one section of the country a large quantity of this class of stone of low unit value was reported used for railroad work. Some quarrymen use the term "rubble" to include stone sold for riprap; the latter is generally a larger-size stone and, when used for walls and foundations (usually as a protection against the encroachment of water), is in loose piles without cementing material. As compared with 1929 the quantity of riprap produced in 1930 increased about 2 per cent. The increase was largely in the limestone used and was chiefly accounted for by the increased use of stone in continued repair work necessitated by the floods of 1928 on the Missouri and Mississippi Rivers. The production of riprap is irregular and is usually accounted for by local conditions.

Monumental stone.—Stone for monumental and memorial work in 1930 decreased 20 per cent in quantity and 17 per cent in value from 1929. The stone used for this class of work is chiefly granite (75 per cent of the total) and marble (25 per cent of the total); a small amount of limestone, not included in these figures, is also used for this work. The output of both granite and marble for this purpose decreased. Quarriers of both varieties of monumental stone sell their product in rough blocks and as finished stone. The quantity and value of both rough and finished monumental granite and marble sold decreased in 1930. Vermont and Georgia produce more marble for memorials than any other States; Vermont, Minnesota, Wisconsin, and North Carolina produce more granite.

Paving blocks, curbstone, flagstone, and crushed stone (road metal and concrete and railroad ballast).—All classes of stone sold for street work decreased in quantity in 1930 compared with 1929. The year 1930 marked the seventh consecutive year of decreased output of paving blocks, the total number reported sold (31,586,260 blocks, valued at $2,669,511) being 1 per cent less than in 1929; the decrease in 1930 was in granite paving blocks, as the number of sandstone blocks increased. The decrease in total value in 1930 was 9 per cent. Curbstone (3,358,583 cubic feet, valued at $3,176,102) decreased 17 per cent in both quantity and value. The decrease was general for all varieties of stone sold for this purpose. Stone for flagging

(1,095,780 cubic feet, valued at $705,775) decreased 3 per cent in quantity but increased 6 per cent in value in 1930. Sales of sandstone for flagging increased, and limestone sold for this purpose decreased. Crushed stone for concrete and road metal and railroad ballast comprised 69 per cent of the total stone output in 1930; the total output of crushed stone in 1930 (87,110,890 short tons, valued at $87,554,354) decreased 6 per cent in quantity and 7 per cent in value. Crushed stone for concrete and road metal (74,293,090 tons, valued at $77,347,379) decreased 2 per cent in quantity and 4 per cent in value; that reported for railroad ballast (12,817,800 tons, valued at $10,206,975) decreased 23 per cent in quantity and 26 per cent in value.

Fluxing stone.—Stone (limestone and marble) used by blast furnaces, open-hearth steelworks, smelters, and other metallurgical plants for fluxing (17,090,710 short tons, valued at $12,362,159) decreased 30 per cent in quantity and 31 per cent in value from 1929.

Refractory stone.—Stone (dolomite, quartzite, and mica schist) reported for refractory use amounted to 1,197,500 short tons, valued at $1,406,776, in 1930, a decrease of 23 per cent in quantity and 22 per cent in value. Sixty per cent of the refractory stone is quartzite (ganister), used chiefly for the manufacture of silica brick but to some extent for furnace and kiln linings, manufacture of ferrosilicon, etc.; the output of this stone in 1930 (718,370 tons, valued at $952,462) decreased 28 per cent in quantity. Mica schist used for furnace and kiln linings amounted to 25,780 tons, valued at $98,289, in 1930, a decrease of 31 per cent in quantity and 32 per cent in value. High-magnesium limestone (dolomite) reported as raw stone for refractory use amounted to 453,350 tons, valued at $356,025, in 1930, a decrease of 12 per cent in quantity and 23 per cent in value. Exact figures for the raw dolomite used for refractories are difficult to obtain because sales to furnaces and smelters tend to cause it to be reported as fluxing stone. Dolomite either is used as raw stone or is dead-burned. Operators who both quarry and dead-burn or sinter dolomite reported 351,740 tons of the sintered material, valued at $3,045,082, a decrease of 28 per cent in quantity and 29 per cent in value from 1929.

Agricultural limestone.—Sales of agricultural limestone in 1930 amounted to 2,542,100 short tons, valued at $3,309,329, a decrease of 4 per cent in quantity and 12 per cent in value. Drought conditions in many of the States curtailed the demand for this class of stone. Burned lime used for agriculture (343,111 short tons, valued at $2,372,779, as given in the report of this series on Lime) increased 1 per cent in quantity and decreased slightly (less than 1 per cent) in value.

Manufacturing industries and "other uses."—The total quantity of stone for manufacturing industries and "other uses" decreased in 1930 compared with 1929, due to the decreased consumption of stone for some of the chief chemicals that employ limestone in their manufacturing processes and also to local conditions that influenced the demand for some of the miscellaneous uses of this class of stone.

PRODUCTION BY STATES

Pennsylvania ranks as the largest producer of stone, followed by Ohio, New York, California, Michigan, and Illinois. Indiana, however, ranks first in value of stone produced, followed by New York, Pennsylvania, and Ohio. Pennsylvania produces more than three times as much stone as Indiana. Pennsylvania, New York, and Michigan produce chiefly crushed stone, and Indiana and Ohio produce high-grade building stone and crushed stone. All the large stone-producing States except New York showed decreased output in 1930. Although the output increased in some of the smaller producing States, the greater number reported declines in production.

Stone sold or used by producers in the United States, 1929 and 1930, by States

State	1929			1930		
	Number of active plants	Short tons (approximate)	Value	Number of active plants	Short tons (approximate)	Value
Alabama	21	1, 262, 120	$2, 249, 601	19	967, 320	$2, 111, 340
Alaska	1	(1)	(1)	----------	----------	----------
Arizona	17	616, 730	582, 406	19	589, 160	516, 886
Arkansas	13	551, 730	761, 064	19	1, 034, 920	1, 203, 729
California	192	11, 818, 300	10, 861, 539	202	10, 690, 030	9, 794, 870
Colorado	38	[2] 834, 260	[2] 903, 846	36	493, 900	878, 656
Connecticut	36	[2] 2, 621, 260	[2] 3, 496, 520	35	2, 436, 520	3, 187, 815
Delaware	2	(1)	(1)	2	(1)	(1)
District of Columbia	2	(1)	(1)	1	(1)	(1)
Florida	35	2, 267, 140	1, 688, 224	27	[2] 1, 796, 670	[2] 1, 490, 173
Georgia	42	977, 910	6, 417, 329	50	[2] 772, 650	[2] 2, 374, 994
Hawaii	10	461, 340	848, 735	9	280, 240	451, 977
Idaho	21	313, 660	335, 957	28	536, 810	513, 752
Illinois	80	8, 407, 730	7, 003, 208	84	7, 590, 920	5, 939, 297
Indiana	85	5, 129, 220	22, 191, 883	93	4, 541, 220	19, 285, 709
Iowa	44	1, 624, 400	1, 549, 743	49	[2] 1, 813, 860	[2] 1, 850, 832
Kansas	49	1, 419, 890	1, 461, 146	48	[2] 1, 248, 670	[2] 1, 245, 088
Kentucky	78	2, 447, 540	2, 587, 592	68	2, 628, 670	2, 635, 369
Louisiana	1	(1)	(1)	1	(1)	(1)
Maine	46	354, 500	2, 902, 603	43	318, 620	2, 252, 097
Maryland	46	1, 163, 630	1, 915, 014	58	[2] 1, 215, 730	[2] 2, 028, 021
Massachusetts	94	[2] 3, 127, 500	[2] 8, 056, 302	78	3, 008, 360	6, 865, 541
Michigan	25	[2] 13, 586, 230	[2] 8, 454, 702	35	[2] 10, 561, 120	[2] 6, 816, 972
Minnesota	54	517, 720	4, 460, 383	48	562, 130	3, 923, 372
Mississippi	3	(1)	(1)	4	22, 190	24, 692
Missouri	124	4, 397, 800	7, 085, 323	126	[2] 3, 910, 060	[2] 6, 007, 531
Montana	22	194, 320	242, 412	27	[2] 592, 810	[2] 284, 658
Nebraska	5	178, 200	335, 789	5	103, 120	188, 674
Nevada	3	33, 400	51, 805	3	30, 120	46, 850
New Hampshire	24	[2] 135, 640	[2] 1, 153, 465	26	150, 800	1, 540, 591
New Jersey	41	2, 740, 410	4, 219, 553	43	2, 702, 420	3, 907, 281
New Mexico	5	[2] 20, 930	[2] 21, 193	4	213, 340	161, 944
New York	165	[2] 11, 693, 640	[2] 15, 895, 914	152	12, 915, 190	18, 141, 668
North Carolina	37	1, 607, 670	3, 880, 113	31	1, 099, 960	2, 456, 887
Ohio	173	14, 771, 030	14, 957, 234	165	13, 008, 030	12, 329, 536
Oklahoma	31	2, 096, 080	1, 728, 938	29	[2] 1, 958, 120	[2] 1, 631, 477
Oregon	110	[2] 1, 951, 890	[2] 1, 905, 747	92	1, 685, 740	1, 708, 956
Pennsylvania	377	18, 169, 270	19, 956, 410	345	15, 137, 560	17, 822, 706
Porto Rico	11	55, 960	90, 675	12	37, 760	85, 324
Rhode Island	16	141, 290	590, 627	16	201, 110	757, 306
South Carolina	15	1, 067, 060	1, 702, 575	10	1, 391, 910	2, 021, 213
South Dakota	25	250, 440	635, 890	24	166, 020	666, 201
Tennessee	48	[2] 2, 419, 070	[2] 8, 043, 006	54	1, 783, 530	5, 186, 653
Texas	54	[2] 3, 647, 150	[2] 2, 948, 865	49	[2] 2, 807, 960	[2] 2, 496, 136
Utah	17	[2] 206, 590	[2] 249, 592	17	633, 630	395, 174
Vermont	41	[2] 367, 240	[2] 9, 435, 680	39	286, 490	7, 983, 160
Virginia	92	[2] 3, 605, 210	[2] 3, 662, 569	93	3, 793, 700	3, 852, 535
Washington	112	1, 673, 390	1, 960, 460	130	[2] 1, 773, 610	[2] 1, 782, 493
West Virginia	30	3, 375, 590	3, 056, 174	42	[2] 3, 062, 130	[2] 2, 715, 821
Wisconsin	150	[2] 4, 004, 200	[2] 6, 166, 708	134	[2] 3, 370, 750	[2] 5, 100, 266
Wyoming	8	322, 260	473, 678	9	[2] 207, 380	[2] 343, 637
Undistributed	----------	2, 481, 040	3, 514, 570	----------	863, 380	3, 942, 751
	2, 771	141, 109, 580	202, 692, 762	2, 733	126, 996, 340	178, 948, 611

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[1] Included under "Undistributed."

[2] To avoid disclosing confidential information, certain State totals are slightly incomplete, the figures not included being combined under "Undistributed."

EXPORTS AND IMPORTS [2]

Exports.—The inclusion of "cement manufactures" with manufactures of natural stone makes the classification of stone exported unsatisfactory, but serves to show in a relative way the trend of the export trade. The figures indicate that the value of the total exports under this classification decreased 21 per cent and the value of the "marble in blocks, rough or dressed" exports decreased 5 per cent.

Value of stone exported from the United States, 1921–1930

Year	Marble in blocks, rough or dressed, and other building or monumental stone [1]	Other manufactures of stone [1]	Total	Year	Marble in blocks, rough or dressed, and other building or monumental stone [1]	Other manufactures of stone [1]	Total
1921	$576,905	$1,697,570	$2,274,475	1926	$687,115	$896,130	$1,583,245
1922	681,658	903,102	1,584,760	1927 [2]	[3] 1,088,949	[4] 1,005,636	2,094,585
1923	625,442	783,195	1,408,637	1928 [2]	[3] 727,432	[4] 1,245,792	1,973,224
1924	499,602	448,731	948,333	1929 [2]	[3] 1,077,286	[4] 1,487,993	2,565,279
1925	507,391	725,677	1,233,068	1930 [2]	[3] 970,141	[4] 1,066,584	2,036,725

[1] Exports classification beginning 1922; prior to 1922 classification read "Stone including marble—unmanufactured and all other."

[2] Beginning 1927 figures not separately recorded for stone and for cement building blocks and for stone and for cement manufactures.

[3] Composed in 1927 of "marble in blocks, rough or dressed," $237,233, and "other building or monumental stone (including cement building blocks)," $851,716; in 1928 of $254,266 and $473,166; in 1929 of $394,654 and $682,632; and in 1930 of $375,964 and $594,177, respectively.

[4] Classification reads "Other manufactures of stone (including other cement manufactures)."

Stone exported from the United States in 1930, by countries

Country	Marble in blocks, rough or dressed		Other building or monumental stone (including cement building blocks) [a]		Value of other manufactures of stone (including paving blocks and curbing and cement manufactures) [a]	Total value
	Cubic feet	Value	Cubic feet	Value		
North America:						
Canada	71,780	$314,337	687,863	$559,929	$629,591	$1,503,857
Central America—						
British Honduras	-	-	-	-	670	670
Costa Rica	-	-	-	-	241	241
Guatemala	28	165	-	-	271	436
Honduras	271	2,127	1	2	1,751	3,880
Nicaragua	548	9,242	-	-	232	9,474
Panama	2,545	6,175	-	-	5,729	11,904
Salvador	-	-	-	-	343	343
Mexico	1,304	5,215	13,395	8,968	51,458	65,641
Newfoundland and Labrador	2,199	11,082	295	191	19,447	30,720
West Indies—						
British—						
Bermudas	-	-	2	50	2,588	2,638
Jamaica	195	4,074	-	-	1,440	5,514
Trinidad and Tobago	-	-	-	-	959	959
Cuba	640	2,674	28,000	18,000	79,117	99,791
Dominican Republic	60	300	-	-	945	1,245
Haiti	10	38	-	-	1,911	1,949
Netherland	-	-	-	-	363	363
Virgin Islands of the United States	22	70	-	-	886	956
Other	442	1,154	114	436	1,949	3,539

[a] Figures not separately recorded for 1930 for stone and for cement building blocks and for stone and for cement manufactures.

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[2] Figures on exports and imports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Stone exported from the United States in 1930, by countries—Continued

Country	Marble in blocks, rough or dressed		Other building or monumental stone (including cement building blocks)		Value of other manufactures of stone (including paving blocks and curbing and cement manufactures)	Total value
	Cubic feet	Value	Cubic feet	Value		
South America:						
Argentina					$2,943	$2,943
Brazil					2,180	2,180
Chile					2,243	2,243
Colombia	1,222	$4,054	11	$76	3,483	7,613
Ecuador					137	137
Peru					642	642
Venezuela	139	2,508			54,665	57,173
Other					840	840
Europe:						
France					19,806	19,806
Germany					15,333	15,333
Netherlands					7,714	7,714
United Kingdom	1,231	3,791	1,148	5,132	27,880	36,803
Other	522	915	31	140	12,864	13,919
Asia:						
China	1	40			414	454
India (British)	8	138			43,025	43,163
Japan	1,271	7,284	84	454	8,720	16,458
Philippine Islands					4,164	4,164
Other	109	568			36,565	37,133
Africa:						
Union of South Africa					4,211	4,211
Other	3	13			981	994
Oceania:						
Australia			50	382	10,694	11,076
New Zealand			365	417	6,464	6,881
Other					725	725
	84,550	375,964	731,359	594,177	1,066,584	2,036,725

Imports.—The value of the total stone imported for consumption in the United States in 1930 decreased 12 per cent. The value of the marble imported decreased 11 per cent and that of the granite 36 per cent. The value of all other stone (including travertine and quartzite, which were reported separately for the first time beginning June 18, 1930) imported increased 12 per cent compared with 1929.

Value of stone imported for consumption in the United States, 1921–1930

1921	$1,253,959	1926	$3,523,578
1922	1,895,912	1927	4,536,407
1923	2,641,337	1928	3,491,353
1924	2,437,654	1929	3,589,259
1925	2,909,887	1930	3,145,861

Stone imported for consumption in the United States, 1929 and 1930, by kinds

Kind	1929		1930	
	Quantity	Value	Quantity	Value
Marble, breccia, and onyx:				
In blocks, rough, etc. ..... cubic feet	667,900	$1,591,070	717,436	$1,578,856
Sawed ..... do	10,859	24,799	797	2,983
Slabs or paving tiles ..... superficial feet	649,899	253,267	591,616	254,179
All other manufactures		566,010		329,279
Mosaic cubes of marble or onyx:				
Loose		1,875		9,383
Attached to paper		33		2,774
		2,437,054		2,177,454
Granite:				
Dressed		292,644		226,318
Rough ..... cubic feet	216,022	378,943	138,831	202,037
		671,587		428,355
Quartzite ..... short tons	(1)	(1)	[2] 102,032	[2] 174,334
Travertine stone (unmanufactured) ..... cubic feet	(1)	(1)	[2] 74,163	[2] 64,997
Stone (other):				
Dressed		62,674		23,396
Rough (monumental or building stone) ..... cubic feet	240,399	184,620	214,424	203,417
Rough (other)		233,324		73,908
		480,618		300,721
Grand total		3,589,259		3,145,861

[1] Not separately classified.

[2] Figures cover June 18 to December 31; not separately classified prior to change in tariff.

Marble, breccia, and onyx (rough and manufactures) imported into the United States, 1929 and 1930, by countries

[General imports]

Country	1929				1930			
	Rough marble, breccia, and onyx		Manufactures (value)	Total value	Rough marble, breccia, and onyx		Manufactures (value)	Total value
	Cubic feet	Value			Cubic feet	Value		
Canada	1,877	$7,511	$14,517	$22,028	606	$819	$647	$1,466
Cuba			2,714	2,714			1,555	1,555
Mexico	18,687	76,889	1,277	78,166	17,203	69,120	724	69,844
Total North America	20,564	84,400	18,508	102,908	17,809	69,939	2,926	72,865
Belgium	63,008	109,041	100,779	209,820	146,535	320,671	89,624	410,295
France	136,270	246,009	174,396	420,405	154,727	282,703	88,217	370,920
Germany	10,854	32,431	97,460	129,891	19,296	54,522	79,169	133,691
Greece	8,959	47,081	97	47,178	14,511	71,719	270	71,989
Italy	447,661	1,051,489	367,030	1,418,519	331,289	719,136	304,299	1,023,435
Netherlands			77	77	1,881	3,538	407	3,945
Spain	20,671	45,478	1,594	47,072	27,257	44,957	2,697	47,654
United Kingdom	794	3,255	22,466	25,721	5,299	15,759	14,545	30,304
Other Europe [1]	9,649	16,903	19,958	36,861	24,542	53,019	18,839	71,858
Total Europe	697,866	1,551,687	783,857	2,335,544	725,337	1,566,024	598,067	2,164,091
China			9,343	9,343			1,841	1,841
Japan			2,929	2,929			949	949
Other countries [2]	8,610	97,913	12,691	110,604	6,496	34,564	1,665	36,229
	8,610	97,913	24,963	122,876	6,496	34,564	4,455	39,019
Grand total	727,040	1,734,000	827,328	2,561,328	749,642	1,670,527	605,448	2,275,975

[1] 1929: Austria, Czechoslovakia, Denmark, Finland, Gibraltar, Hungary, Irish Free State, Malta and Gozo, Cyprus, Norway, Poland and Danzig, Portugal, Rumania, Soviet Russia, Switzerland, and Yugoslavia and Albania; 1930: Austria, Czechoslovakia, Denmark, Finland, Hungary, Norway, Portugal, Rumania, Sweden, Switzerland, and Yugoslavia.

[2] 1929: Algeria and Tunisia, Argentina, Brazil, Ceylon, Egypt, Hong Kong, India (British), Palestine, Syria, Turkey in Asia, and Union of South Africa; 1930: Argentina, Australia, Brazil, British Malaya, Chile, Egypt, Hong Kong, India (British), Palestine, and Syria.

Value of building or monumental stone (exclusive of marble, breccia, and onyx) and other classes of stone imported into the United States, 1929 and 1930, by countries

[General imports]

Country	1929			1930		
	Building or monumental stone	Other stone	Total	Building or monumental stone	Other stone	Total
North America:						
Canada	$35,614	$205,874	$241,488	$34,063	$236,739	$270,802
Mexico	23	4,460	4,483	947		947
Total North America	35,637	210,334	245,971	35,010	236,739	271,749
Europe:						
Austria	58		58	2,654		2,654
Belgium	3,036		3,036	3,521		3,521
Czechoslovakia	37,347		37,347	31,565		31,565
Denmark		553	553			
Finland	151,574		151,574	103,312		103,312
France	57,333	172	57,505	76,786		76,786
Germany	121,511	6,328	127,839	110,174	8,677	118,851
Italy	228,257		228,257	251,804		251,804
Netherlands	16,843	600	17,443	191		191
Norway	59,140	186	59,326	23,277		23,277
Portugal	22,638		22,638	1,804		1,804
Spain	3,083		3,083	1,579	41	1,620
Sweden	224,687		224,687	81,708		81,708
United Kingdom	53,523	6,243	59,766	22,909	1,668	24,577
Other Europe	1,063	500	1,563	9,996		9,996
Total Europe	980,093	14,582	994,675	721,280	10,386	731,666
Other countries [1]	9,944	18	9,962	127,276	5,966	133,242
Grand total	1,025,674	224,934	1,250,608	883,566	253,091	1,136,657

[1] 1929: Brazil, China, Cuba, Hong Kong, Japan, Palestine, and Union of South Africa; 1930: Argentina, Brazil, China, Cuba, French Oceania, Hong Kong, India (British), Japan, Philippine Islands, and United Kingdom.

TARIFF

As the tariff act of 1930 made a few changes in the rates of duty on imported stone, the following table is given to show the present rates as compared with those prevailing prior to June 18, 1930:

Tariff on stone prior to and after June 18, 1930

Commodity	Prior to June 18, 1930	Act of June 18, 1930
Marble, onyx, and breccia:		
In block, rough or squared only ... cubic foot	65 cents	65 cents.
Sawed or dressed, over 2 inches thick ... do	$1	$1.
Slabs or paving tiles, not less than 4 superficial inches—		
Not over 1 inch thick—		
Unrubbed ... superficial foot	8 cents	8 cents.
Rubbed ... do	11 cents	11 cents.
Polished ... do		14 cents.
Over 1, not over 1½ inches thick—		
Unrubbed ... do	10 cents	10 cents.
Rubbed ... do	13 cents	13 cents.
Polished ... do		16 cents.
Over 1½, not over 2 inches thick—		
Unrubbed ... do	13 cents	13 cents.
Rubbed ... do	16 cents	16 cents.
Polished ... do		19 cents.
Mosaic cubes not over 2 cubic inches in size—		
Loose ... pound and ad valorem	¼ cent + 20 per cent	¼ cent + 20 per cent.
Attached to paper or other material ... superficial foot and ad valorem	5 cents + 35 per cent.	5 cents + 35 per cent.
Monuments, benches, vases, and other articles of marble, onyx, or breccia ... ad valorem	50 per cent	50 per cent.

Tariff on stone prior to and after June 18, 1930—Continued

Commodity	Prior to June 18, 1930	Act of June 18, 1930
Other building or monumental stone:		
Granite—		
Unmanufactured ... cubic foot		25 cents.
Quarry block, rough ... do	15 cents	
Hewn, dressed, or polished ... ad valorem	50 per cent	
Hewn, dressed, pointed, pitched, lined, or polished ... do		60 per cent.
Sandstone, limestone, freestone, lava, and other monumental or building stone, n. e. s.—		
Quarry block, rough ... cubic foot	15 cents	15 cents.
Hewn, dressed, or polished ... ad valorem	50 per cent	50 per cent.
Travertine stone, unmanufactured ... cubic foot		25 cents.
Other stone:		
Granite, sandstone, freestone, unmanufactured and not suitable as monumental or building stone, quartzite, and trap rock	Free	Free.
Limestone, not suitable as monumental or building stone, crude or crushed but not pulverized ... 100 pounds	5 cents	5 cents.

PRODUCTION BY KINDS AND STATES

GRANITE

The output of granite in 1930 was 10,047,430 short tons, valued at $30,423,853, a decrease of 7 per cent in quantity and 11 per cent in value compared with 1929. With the exception of a slight increase in quantity of crushed stone sold, both the quantity and value for all the principal uses for which granite was sold decreased. Crushed granite for concrete and road metal and railroad ballast (5,939,150 short tons, valued at $6,989,334), which represented 59 per cent of the total quantity of granite in 1930, increased less than 1 per cent in quantity and decreased 3 per cent in value. Crushed stone sold for railroad ballast (1,460,430 tons, valued at $1,277,296) increased 8 per cent in quantity but decreased slightly in total value. Crushed stone for concrete and road metal (4,478,720 tons, valued at $5,712,038) decreased 2 per cent in quantity and 4 per cent in value. Granite paving blocks and granite curbing decreased 3 and 21 per cent, respectively, in quantity. Granite sold for rubble showed the largest decrease in quantity—46 per cent—and granite for riprap decreased 18 per cent in quantity. Granite sold for miscellaneous uses decreased 12 per cent. As in 1929, the large volume of granite included under "Other uses" in 1930 can be ascribed to granite quarried in California for use as filler in dam construction. Granite for use in memorials (2,638,600 cubic feet, valued at $9,894,167), which, with that sold for construction, represents the highest grade of granite, decreased 21 per cent in quantity and 17 per cent in value. The decrease was in sales of both rough and dressed stone. Granite for construction (5,706,970 cubic feet, valued at $7,800,282) decreased 8 per cent in quantity and 4 per cent in value. As may be noted on page 335 the quantity of dressed stone sold by the quarry operators increased slightly, but the quantity sold for rough construction and architectural stone decreased.

In 1930, as in 1929, California was the largest producer of granite in the United States, chiefly because of the large amount of stone quarried for rock fill on a dam. South Carolina, North Carolina, Massachusetts, and Virginia followed in order. The leading State in value of granite output, however, was Massachusetts, followed by Vermont, Minnesota, California, North Carolina, and Wisconsin. The granite from South Carolina and Virginia is used principally for crushed stone; that from Vermont and Minnesota principally for monumental stone and architectural building stone; and that from California, Massachusetts, North Carolina, and Wisconsin for many kinds of granite products.

Granite sold or used by producers in the United States, 1929 and 1930, by uses

Use	1929		1930	
	Quantity	Value	Quantity	Value
Building stone (rough and dressed)----------cubic feet--	6,202,270	$8,105,364	5,706,970	$7,800,282
Approximate equivalent in short tons	511,000	------------	464,550	------------
Monumental stone----------cubic feet--	3,344,380	11,962,645	2,638,600	9,894,167
Approximate equivalent in short tons	275,720	------------	216,090	------------
Paving----------number of blocks--	28,174,330	2,651,383	27,248,390	2,348,025
Approximate equivalent in short tons	259,470	------------	245,060	------------
Curbing----------linear feet--	2,905,070	2,126,421	2,298,920	1,767,994
Approximate equivalent in short tons	162,740	------------	133,100	------------
Rubble----------short tons--	502,100	523,583	271,460	225,074
Riprap----------do----	651,890	734,131	535,200	450,984
Crushed stone----------do----	5,923,650	7,225,647	5,939,150	6,989,334
Other uses----------do----	2,540,160	895,936	2,242,820	947,993
Total (quantities approximate, in short tons)	10,826,730	34,225,110	10,047,430	30,423,853

Granite sold or used by producers in the United States, 1929 and 1930, by States

[Quantities approximate]

State	1929		1930	
	Short tons	Value	Short tons	Value
Arizona	1,430	$3,393	173,370	$83,079
California	3,702,550	3,007,501	3,362,640	2,596,821
Colorado	36,720	276,618	35,320	282,925
Connecticut	47,570	550,405	42,860	549,182
Delaware	(1)	(1)	(1)	(1)
District of Columbia	(1)	(1)	(1)	(1)
Georgia	493,670	2,151,354	456,800	1,996,934
Idaho	(1)	(1)	(1)	(1)
Maine	228,710	2,688,589	204,720	2,093,561
Maryland	430,130	746,126	213,980	631,287
Massachusetts	751,180	4,840,852	766,690	3,935,961
Minnesota	66,580	3,249,752	51,150	2,668,119
Missouri	9,760	54,642	9,700	48,599
Montana	9,290	40,145	3,990	38,022
New Hampshire	135,640	1,153,465	127,550	1,483,805
New Jersey	(1)	(1)	(1)	(1)
New York	221,270	616,573	226,160	830,958
North Carolina	1,458,000	3,569,961	1,033,890	2,343,369
Oklahoma	17,250	174,650	10,230	121,652
Oregon	(1)	(1)	(1)	(1)
Pennsylvania	285,540	598,912	199,290	529,114
Rhode Island	42,350	423,695	71,700	531,353
South Carolina	1,067,060	1,702,575	1,391,910	2,021,213
South Dakota	11,950	300,134	5,340	398,917
Texas	19,430	187,081	47,260	221,786
Utah	400	13,900	(1)	(1)
Vermont	194,940	4,507,716	133,570	3,638,124
Virginia	923,010	1,003,034	711,450	764,348
Washington	112,760	94,881	55,500	103,629
Wisconsin	355,060	1,918,407	486,250	2,126,321
Undistributed	204,480	350,749	226,110	384,774
	10,826,730	34,225,110	10,047,430	30,423,853

[1] Included under "Undistributed."

The following table shows the uses of the granite produced and sold by the quarrymen in the various States.

Granite sold or used by producers in the United States in 1930, by States and uses

State	Number of active plants	Building						Monumental				Paving blocks	
		Rough				Dressed		Rough		Dressed			
		Construction		Architectural									
		Short tons	Value	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value	Number	Value
Arizona	4	--------	--------	--------	--------	--------	--------	(1)	(1)	--------	--------	--------	--------
California	36	760	$3,070	2,640	$1,729	90,920	$538,595	40,970	$218,541	23,820	$139,402	--------	--------
Colorado	10	--------	--------	38,610	55,154	--------	--------	1,270	1,470	21,900	178,723	--------	--------
Connecticut	11	3,100	5,033	7,820	10,627	45,520	268,919	14,860	40,217	14,160	111,704	(1)	(1)
Delaware	2	(1)	(1)	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
District of Columbia	1	(1)	(1)	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Georgia	38	--------	--------	(2)	(2)	[2] 98,390	[2] 421,614	203,980	302,510	66,570	232,348	2,694,170	$196,772
Idaho	1	--------	--------	--------	--------	--------	--------	--------	--------	(1)	(1)	--------	--------
Maine	34	15,800	12,713	355,630	379,824	161,580	413,817	48,140	57,922	8,160	50,054	10,741,580	991,119
Maryland	14	72,920	248,342	3,600	3,500	46,200	122,500	1,200	1,560	400	1,775	--------	--------
Massachusetts	39	24,660	34,917	267,190	268,887	312,440	1,343,050	108,710	242,828	44,210	302,065	2,677,460	222,587
Minnesota	26	(1)	(1)	(2)	(2)	[2] 316,420	[2] 1,177,154	99,520	238,188	136,500	1,233,567	(1)	(1)
Missouri	4	--------	--------	(1)	(1)	--------	--------	(1)	(1)	--------	--------	(1)	(1)
Montana	9	--------	--------	--------	--------	2,400	16,800	2,510	4,576	890	14,710	--------	--------
New Hampshire	24	1,280	4,553	71,750	74,844	84,620	634,503	60,870	90,036	33,290	134,747	4,600,120	327,193
New Jersey	2	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
New York	17	2,530	3,583	(2)	(2)	[2] 38,140	[2] 493,993	--------	--------	(1)	(1)	(1)	(1)
North Carolina	25	24,110	65,595	(1)	(1)	(1)	(1)	(2)	(2)	[2] 67,320	[2] 483,848	2,215,110	148,991
Oklahoma	9	--------	--------	--------	--------	(1)	(1)	4,140	8,932	14,440	104,395	--------	--------
Oregon	2	--------	--------	--------	--------	(1)	(1)	--------	--------	(1)	(1)	--------	--------
Pennsylvania	24	62,990	164,993	[3] 66,990	[3] 44,497	(3)	(3)	[3] 37,900	[3] 149,555	(3)	(3)	(1)	(1)
Rhode Island	9	(1)	(1)	--------	--------	(1)	(1)	[3] 69,210	[3] 366,602	(3)	(3)	--------	--------
South Carolina	10	(1)	(1)	--------	--------	--------	--------	(1)	(1)	(1)	(1)	--------	--------
South Dakota	7	--------	--------	--------	--------	--------	--------	(2)	(2)	[2] 55,000	[2] 397,047	--------	--------
Texas	6	40,050	66,045	12,390	9,027	15,650	46,068	36,630	79,885	1,820	19,164	--------	--------
Utah	2	--------	--------	(1)	(1)	--------	--------	(1)	(1)	(1)	(1)	--------	--------
Vermont	22	(1)	(1)	--------	--------	(1)	(1)	[3] 1,168,400	[3] 3,348,938	(3)	(3)	--------	--------
Virginia	9	11,600	28,935	1,800	1,500	--------	--------	--------	--------	--------	--------	--------	--------
Washington	11	--------	--------	1,440	2,150	4,100	22,701	1,570	4,412	3,360	21,893	--------	--------
Wisconsin	19	--------	--------	--------	--------	(1)	(1)	2,990	5,475	87,490	945,909	3,453,980	376,529
Undistributed	--------	24,040	45,412	69,390	60,337	68,740	705,301	148,380	299,200	8,020	61,969	865,970	84,834
	427	283,840	683,191	902,390	930,329	1,281,980	6,186,762	2,005,920	5,088,191	632,680	4,805,976	27,248,390	2,348,025

See footnotes at end of table.

Granite sold or used by producers in the United States in 1930, by States and uses—Continued

State	Curbing		Rubble		Riprap		Crushed stone				Other uses		Total	
							Concrete and road metal		Railroad ballast					
	Linear feet	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons (approximate)	Value
Arizona					18,010	$6,476	25,000	$25,000	(1)	(1)			173,370	$83,079
California	16,400	$6,677	180,370	$139,242	66,320	19,700	696,420	591,099	257,100	$137,465	2,147,670	$801,301	3,362,640	2,596,821
Colorado					(1)	(1)	(1)	(1)	(1)	(1)			35,320	282,925
Connecticut	50,260	56,814	740	2,810	19,630	12,538	5,110	5,847			(1)	(1)	42,860	549,182
Delaware					(1)	(1)	(1)	(1)					(1)	(1)
District of Columbia													(1)	(1)
Georgia	776,350	520,285	(1)	(1)	31,330	24,066	279,450	274,255	(1)	(1)			456,800	1,996,934
Idaho													(1)	(1)
Maine	141,060	128,584	10,100	5,025	450	1,072	29,030	53,093			2,000	338	204,720	2,093,561
Maryland					6,000	9,000	103,340	190,854	27,500	53,756			213,980	631,287
Massachusetts	655,100	597,010	19,320	13,325	3,520	3,998	577,970	890,827			10,330	16,467	766,690	3,935,961
Minnesota					2,130	710	(1)	(1)					51,150	2,668,119
Missouri					(1)	(1)	(1)	(1)					9,700	48,599
Montana					3,570	1,936							3,990	38,022
New Hampshire	252,120	145,208	(1)	(1)	10,190	5,528	39,200	64,157			(1)	(1)	127,550	1,483,805
New Jersey							(1)	(1)					(1)	(1)
New York					(1)	(1)	64,890	63,194	137,170	196,294	(1)	(1)	226,160	830,958
North Carolina	385,790	292,185	(1)	(1)	(1)	(1)	710,450	906,063	213,540	219,724	6,850	43,680	1,033,890	2,343,369
Oklahoma			(1)	(1)	1,650	959	5,480	3,887	1,470	1,484			10,230	121,652
Oregon													(1)	(1)
Pennsylvania			(1)	(1)			60,420	81,420	50,000	54,000	390	1,000	199,290	529,114
Rhode Island	(1)	(1)	(1)	(1)	(1)	(1)	54,020	75,816	2,410	4,159	(1)	(1)	71,700	531,353
South Carolina	(1)	(1)	30,140	23,179	8,040	10,334	1,223,440	1,610,087	110,690	84,396	1,590	1,902	1,391,910	2,021,213
South Dakota							(1)	(1)			(1)	(1)	5,340	398,917
Texas			(1)	(1)							(1)	(1)	47,260	221,786
Utah					(1)	(1)							(1)	(1)
Vermont							36,860	38,450					133,570	3,638,124
Virginia			600	900	(1)	(1)	210,460	280,100	(1)	(1)			711,450	764,348
Washington					15,800	8,781	38,830	43,692					55,500	103,629
Wisconsin	(1)	(1)	(1)	(1)	245,660	225,501	140,590	242,369			58,160	57,997	486,250	2,126,321
Undistributed	21,840	21,231	30,190	40,593	102,900	120,385	177,760	271,828	660,550	526,018	15,830	25,308	226,110	384,774
	2,298,920	1,767,994	271,460	225,074	535,200	450,984	4,478,720	5,712,038	1,460,430	1,277,296	[4] 2,242,820	[4] 947,993	10,047,430	30,423,853

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[1] Included under "Undistributed."

[2] Rough stone included under dressed stone.

[3] Dressed stone included under rough stone.

[4] Includes 6,880 tons of Durax blocks, valued at $65,983, made in Massachusetts, North Carolina, and Wisconsin.

The following table gives statistics covering sales of monumental granite by the quarrymen at Quincy, Mass., during the past 10 years. The quarry operators furnishing this stone in 1930 were the Granite Railway Co., Gray Rock Granite Co. (Inc.), The Quincy Quarries Co., Rock Quarry Co., and J. S. Swingle (Inc.), all of Quincy; the quarries also furnished for construction work 14,410 tons of stone, valued at $11,646, in 1930, and about 15,000 tons, valued at $18,300, in 1929. Crushed-stone plants also are operated in the vicinity of Quincy.

Monumental granite sold by the quarrymen at Quincy, Mass., 1921–1930

Year	Number of active plants	Short tons (approximate)	Value	Year	Number of active plants	Short tons (approximate)	Value
1921	6	14,000	$311,178	1926	7	23,000	$438,963
1922	6	16,000	341,601	1927	5	21,130	375,613
1923	6	27,150	596,709	1928	6	12,400	369,184
1924	6	26,630	527,915	1929	6	10,840	288,492
1925	7	26,500	509,329	1930	5	8,030	224,165

The following table shows the quantity and value of monumental granite sold by the quarrymen in the Barre district of Vermont during the past 10 years. The quarry operators in this district in 1930 were the Barre Granite Quarrying Co., Jones Bros. (Inc.), Littlejohn & Milne Quarry Co., James K. Pirie Estate, Rock of Ages Corporation, E. L. Smith & Co., Standard Granite Co. (Inc.), Wells-Lamson Quarry Co., and Wetmore & Morse Granite Co., all of Barre. Granite from this district is used also for construction and for the manufacture of paving blocks.

Monumental granite sold by the quarrymen in the Barre district, Vermont, 1921–1930

Year	Cubic feet	Value	Year	Cubic feet	Value
1921	686,947	$2,417,024	1926	1,062,160	$3,311,066
1922	453,000	1,395,911	1927	1,115,400	3,426,732
1923	1,208,010	3,300,805	1928	1,225,800	3,395,628
1924	1,025,930	3,366,497	1929	1,140,540	3,485,191
1925	981,560	3,192,282	1930	1,024,600	2,996,032

Through the kindness of the Granite Manufacturers' Association, Barre, the following figures covering the entire granite industry of the Barre district are given to supplement the figures of sales reported to the Bureau of Mines by the quarrymen:

Estimated output of monumental granite in Barre district, Vermont, 1927–1930

	1927	1928	1929	1930
Total quarry output, rough stock ... cubic feet	1,179,822	1,549,443	1,268,178	1,125,840
Shipped out of Barre district in rough ... do	235,964	309,889	253,636	225,168
Manufactured in Barre district ... do	943,858	1,239,554	1,014,542	900,672
Light stock consumed in district ... do	589,910	774,720	634,091	562,920
Dark stock consumed in district ... do	353,948	464,834	380,451	337,752
Number of cutters in district	1,200	1,600	1,500	1,500
Average daily wage	$9.00	$9.00	$9.00	$9.00
Average number of days worked	227	256	256	256
Total pay roll for year	$2,451,600	$3,686,400	$3,456,000	$3,456,000
Estimated overhead	1,225,800	1,843,200	1,728,000	1,728,000
Estimated value of light stock	2,654,600	3,486,240	2,853,396	2,026,512
Estimated value of dark stock	1,902,463	2,498,484	2,044,942	1,452,333
Estimated polishing cost	743,500	980,334	802,377	712,317
Output from saws	325,000	326,778	267,459	237,439
Total value of granite	9,302,963	12,821,436	11,152,174	9,612,601

BASALT AND RELATED ROCKS (TRAP ROCK)

Basalt and related rocks (trap rock) are quarried and sold chiefly for crushed stone. The output in 1930 (14,532,250 short tons, valued at $17,053,031) decreased 2 per cent in quantity and 10 per cent in value. The principal product, crushed stone, which represented 94 per cent of the total basalt produced in 1930, decreased 4 per cent in quantity and 9 per cent in value; crushed basalt for concrete and road metal (12,238,210 tons, valued at $14,483,363) decreased 2 per cent in quantity and 7 per cent in value; and crushed basalt for railroad ballast (1,473,870 tons, valued at $1,561,728) decreased 19 per cent in quantity and 20 per cent in value. Basalt used for construction, riprap, and rubble also decreased in output. The large increase in the quantity of stone reported under "Other" was due principally to large amounts of stone used by railroads for filling purposes in Montana and Washington. Under "Other" are also reported roofing granules made chiefly from altered diabase (greenstone); the output of such granules amounted to 87,080 short tons, valued at $588,760, a decrease of 33 per cent in quantity and 32 per cent in value from 1929. In the figures for granite, sandstone, and miscellaneous varieties of stone an amount of "roofing granules" is also reported, which increases the total output of roofing granules made from stone to 117,510 tons, valued at $727,264. An output of 289,700 tons of slate, valued at $1,695,417, for use as slate granules or "flour" is shown in the report of this series on Slate.

Basalt and related rocks (trap rock) sold or used by producers in the United States, 1929 and 1930, by uses

Use	1929		1930	
	Quantity	Value	Quantity	Value
Building stone……cubic feet	487, 800	$65, 462	421, 420	$73, 717
Approximate equivalent in short tons	42, 250		36, 260	
Rubble……short tons	9, 390	4, 896	3, 190	1, 123
Riprap……do	338, 480	433, 476	187, 090	205, 538
Crushed stone……do	14, 329. 880	17, 565, 319	13, 712, 080	16, 045, 091
Other……do	151, 780	877, 044	593, 630	727, 562
Total (quantities approximate, in short tons)	14, 871, 780	18, 946, 197	14, 532, 250	17, 053, 031

Basalt and related rocks (trap rock) sold or used by producers in the United States, 1929 and 1930, by States

[Quantities approximate]

State	1929		1930	
	Short tons	Value	Short tons	Value
California	1, 073, 760	$1, 086, 480	794, 420	$903, 570
Connecticut	2, 536, 660	2, 833, 224	2, 337, 720	2, 440, 151
Hawaii	458, 670	839, 383	277, 520	442, 869
Idaho	194, 670	203, 144	408, 500	378, 038
Maryland	355, 440	522, 447	325, 100	470, 441
Massachusetts	1, 911, 840	2, 207, 677	1, 743, 890	1, 874, 042
Michigan	(1)	(1)	118, 490	202, 335
Minnesota	149, 810	327, 542	155, 130	302, 115
Montana	(1)	(1)	494, 560	131, 502
New Jersey	2, 457, 620	3, 650, 332	2, 412, 970	3, 313, 917
New York	(1)	(1)	1, 235, 580	1, 989, 416
Oregon	1, 446, 100	1, 312, 458	1, 476, 050	1, 419, 734
Pennsylvania	1, 443, 610	2, 143, 164	1, 203, 370	1, 714, 137
Texas	(1)	(1)	(1)	(1)
Virginia	6, 150	9, 558	(1)	(1)
Washington	1, 247, 910	1, 361, 557	1, 318, 720	1, 200, 323
Wisconsin	(1)	(1)	(1)	(1)
Undistributed	1, 589, 540	2, 449, 231	230, 230	270, 441
	14, 871, 780	18, 946, 197	14, 532, 250	17, 053, 031

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[1] Included under "Undistributed."

Basalt and related rocks (trap rock) sold or used by producers in the United States in 1930 by uses

State	Number of active plants	Building, rough construction		Rubble and riprap		Crushed stone				Other uses		Total	
						Concrete and road metal		Railroad ballast					
		Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons (approximate)	Value
California	19	60	$750	39,840	$75,069	736,990	$692,945	2,410	$2,127	15,120	$132,679	794,420	$903,570
Connecticut	16	14,550	16,364	650	258	2,076,930	2,177,473	239,960	240,429	5,630	5,627	2,337,720	2,440,151
Hawaii	8	(1)	(1)	270	300	275,010	438,839	1,920	3,209	(1)	(1)	277,520	442,869
Idaho	19			(1)	(1)	318,460	310,517	(1)	(1)			408,500	378,038
Maryland	8	(1)	(1)	2,740	4,200	166,420	250,460	(1)	(1)	(1)	(1)	325,100	470,441
Massachusetts	17	590	760			1,352,370	1,477,063	390,930	396,219			1,743,890	1,874,042
Michigan	9					97,490	121,335	(1)	(1)	(1)	(1)	118,490	202,335
Minnesota	3			(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	155,130	302,115
Montana	8			50,940	31,116					443,620	100,386	494,560	131,502
New Jersey	32	(1)	(1)	(1)	(1)	2,329,470	3,201,474	81,410	100,143			2,412,970	3,313,917
New York	3					1,168,720	1,909,188	66,860	80,228			1,235,580	1,989,416
Oregon	83			12,050	7,051	1,456,510	1,410,195			7,490	2,488	1,476,050	1,419,734
Pennsylvania	21	17,190	40,929	8,160	9,501	901,810	1,142,078	219,030	261,556	57,180	260,073	1,203,370	1,714,137
Texas	1					(1)	(1)	(1)	(1)			(1)	(1)
Virginia	2					(1)	(1)					(1)	(1)
Washington	88			66,020	68,563	1,158,020	1,063,787	64,680	52,973	30,000	15,000	1,318,720	1,200,323
Wisconsin	1			(1)	(1)	(1)	(1)					(1)	(1)
Undistributed		3,870	14,914	9,610	10,603	200,010	288,009	406,670	424,844	34,590	211,309	230,230	270,441
	338	36,260	73,717	190,280	206,661	12,238,210	14,483,363	1,473,870	1,561,728	593,630	727,562	14,532,250	17,053,031

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[1] Included under "Undistributed."

MARBLE

The total marble sold by producers in 1930 (477,240 short tons, valued at $12,905,596) represented a decrease of 14 per cent in quantity and 22 per cent in value compared with 1929. The output of dimension stone used for monumental and construction work (3,350,370 cubic feet, valued at $12,339,414) decreased 13 per cent in quantity and 23 per cent in value. Marble used for construction (2,471,100 cubic feet, valued at $9,076,031) decreased 11 per cent in quantity and 25 per cent in value. Marble used for monumental and memorial work (879,270 cubic feet, valued at $3,263,383) decreased 17 per cent in quantity and 16 per cent in value. Rough marble sold by tonnage for terrazzo, stucco, mosaic, marble dust, and by-product stone, such as rubble, riprap, flux, and other rough stone, decreased 15 per cent in quantity but increased 6 per cent in value.

Marble sold by producers in the United States, 1929 and 1930, by uses

Use	1929		1930	
	Quantity	Value	Quantity	Value
Building stone:				
Rough—				
Exterior cubic feet	133, 500	$313, 053	145, 250	$266, 843
Interior do	635, 620	1, 434, 137	547, 270	1, 184, 472
Finished—				
Exterior do	790, 920	3, 536, 457	627, 670	2, 419, 081
Interior do	1, 218, 760	6, 842, 069	1, 150, 910	5, 205, 635
Total exterior do	924, 420	3, 849, 510	772, 920	2, 685, 924
Total interior do	1, 854, 380	8, 276, 206	1, 698, 180	6, 390, 107
Total building stone do	[1] 2, 778, 800	[1] 12, 125, 716	[1] 2, 471, 100	[1] 9, 076, 031
Monumental stone:				
Rough do	188, 610	187, 623	126, 060	124, 343
Finished do	877, 150	3, 697, 858	753, 210	3, 139, 040
Total monumental stone do	[1] 1, 065, 760	[1] 3, 885, 481	[1] 879, 270	[1] 3, 263, 383
Total building and monumental cubic feet	3, 844, 560	16, 011, 197	3, 350, 370	12, 339, 414
Total building and monumental approximate short tons	324, 030		281, 550	
Marble for other uses (by-products) short tons	229, 630	534, 115	195, 690	566, 182
Total marble, approximate short tons	553, 660	16, 545, 312	477, 240	12, 905, 596

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[1] Building-stone figures may be somewhat less than given and monumental stone somewhat more, as some of the Tennessee producers were unable to divide their product according to use.

Marble sold by producers in the United States, 1929 and 1930, by States and uses

State	Building and monumental (rough and finished)		Other uses		Total	
	Cubic feet	Value	Short tons	Value	Short tons (approximate)	Value
1929						
Alabama	52, 900	$381, 781	36, 400	$61, 738	40, 900	$443, 519
California	14, 260	71, 259	1, 570	9, 575	2, 780	80, 834
Georgia	676, 190	3, 739, 825	26, 300	37, 450	82, 920	3, 777, 275
Massachusetts	19, 720	97, 910	2, 510	3, 542	4, 180	101, 452
Missouri	477, 010	927, 530	15, 900	4, 941	55, 420	932, 471
New York	51, 220	129, 202	44, 160	187, 760	48, 640	316, 962
Tennessee	1, 312, 180	5, 678, 596	58, 950	60, 408	169, 630	5, 739, 004
Vermont	1, 185, 100	4, 763, 471	29, 350	35, 242	129, 940	4, 798, 713
Other States [1]	55, 980	221, 623	14, 490	133, 459	19, 250	355, 082
	3, 844, 560	16, 011, 197	229, 630	534, 115	553, 660	16, 545, 312
1930						
Alabama	99, 790	481, 186	27, 900	65, 033	36, 280	546, 219
California	15, 740	50, 640	8, 000	59, 187	9, 340	109, 827
Missouri	395, 960	839, 616	17, 630	11, 721	48, 700	851, 337
New York	68, 350	161, 214	42, 570	211, 251	48, 550	372, 465
Tennessee	1, 019, 300	3, 355, 673	50, 020	44, 412	136, 020	3, 400, 085
Vermont	1, 098, 080	4, 206, 456	20, 300	24, 527	113, 560	4, 230, 983
Other States [1]	653, 150	3, 244, 629	29, 270	150, 051	84, 790	3, 394, 680
	3, 350, 370	12, 339, 414	195, 690	566, 182	477, 240	12, 905, 596

[1] 1929: Alaska, Arizona, Arkansas, Colorado, Idaho, Maryland, Montana, New Jersey, North Carolina, Utah, Virginia, and Washington; 1930: Arizona, Arkansas, Colorado, Georgia, Maryland, Massachusetts, New Jersey, North Carolina, Utah, Virginia, and Washington.

SERPENTINE

The figures showing sales of serpentine (verde antique) for interior and exterior building, dimension stone, and by-products are included in the figures for marble, but those showing sales of serpentine as crushed stone for road metal, ballast, riprap, and other low-grade material are included in the figures for "miscellaneous" stone. The States represented in the production of serpentine in 1930 are California, Georgia, Maryland, Massachusetts, New Jersey, Vermont, and Washington.

Serpentine (verde antique) sold by producers in the United States, 1929 and 1930, by uses

Use	1929		1930	
	Quantity	Value	Quantity	Value
Building and ornamental stone……cubic feet	111, 580	$842, 058	98, 490	$695, 131
Rough construction, crushed, etc……short tons	138, 530	310, 612	110, 470	215, 689
	----------	1, 152, 670	----------	910, 820

PRODUCING LOCALITIES—MARBLE, "ONYX," AND SERPENTINE

The locations of the marble, "onyx," and serpentine deposits in the United States reporting in 1930 and the owners or operators of these deposits, by States, are as follows:

Alabama.—Marble was produced in Alabama in 1930 for commercial purposes by the Alabama Marble Co. at Gantts Quarry and by the Sylacauga Marble Corporation and the Moretti-Harrah Marble Co., both at Sylacauga. This marble is sold for building and monumental work, with the broken stone for terrazzo, riprap, whiting substitute, furnace flux, and other crushed stone.

Alaska.—No marble was quarried during 1930 at the Tokeen (Alaska) quarries of the Vermont Marble Co.

Arizona.—Deposits of "onyx" marble were operated in 1930 at Cave Creek near Phoenix, Maricopa County, by the Arizona Onyx Manufacturing Co. This "onyx" was used chiefly for terrazzo floors.

Arkansas.—The marble quarries at Batesville, Independence County, are owned by the Batesville Marble Quarries Co. and the Batesville Black Marble Co. (successor to the Terry Marble Corporation). The White River Marble Co. produces at irregular intervals a small amount of stone at Cartney, Baxter County.

California.—The companies producing marble for dimension stone during 1930 were as follows: The Carrara Marble Co. of Amador County (address, 2895 Third Street, San Francisco), Jackson (Pine Grove), Amador County; the Inyo Marble Co. (address, 359 North Avenue 22, Los Angeles), Lone Pine, Inyo County; and the Columbia Marble Co. (address, Rialto Building, San Francisco), Columbia, Tuolumne County. Small amounts of "onyx" and "travertine," chiefly for terrazzo and stucco work, were quarried by the following: John Olson (address, White Water), from the Pipe Canyon quarry in San Bernardino County near Banning; Grassi Bros., Fairfield, Solano County; L. Cardini (address, 121 Fourteenth Street, San Francisco), from the Tolinas quarry, Suisun City, Solano County; and Walter S. McLean (address, 1919 San Bruno Avenue, San Francisco), Sonora, Tuolumne County.

Colorado.—The marble quarries at Marble, Gunnison County, owned by the Vermont Marble Co., were operated in 1930 by the Yule Colorado Marble Co.; this marble is sold for interior and exterior building and memorial work and is shipped both in rough blocks and as finished stone. The United States Marble Co. (address, Temple Court, Denver) operated marble properties near Salida (English quarry), Chaffee County, and Canon City (Twin Mountain quarry), Fremont County, in 1930; the product was sold for terrazzo.

Georgia.—The Georgia Marble Co. at Tate, Pickens County, produced marble for exterior and interior construction and for memorial work; it also quarried "verde antique" (serpentine) near Hollysprings, Cherokee County, and shipped stone for interior building. The American Marble Co. (address, Norris Building, Atlanta) operated a marble quarry at Whitestone, Pickens County. The stone was sold in the form of monuments.

Maryland.—The Beaver Dam Marble Co. (address, 417 East Oliver Street, Baltimore) quarried and sold marble for exterior building from quarries at Cockeysville, Baltimore County. The Cockeysville stone was also sold for agricultural use and for stucco, grit, and other crushed-stone products. Serpentine was quarried near Cardiff, Harford County, by The Cardiff Green Marble Co. (Inc.). This stone was used for interior construction, stucco, terrazzo, and other crushed-stone products.

Massachusetts.—The Lee Marble Works, Lee, Berkshire County, was the only firm quarrying marble in Massachusetts in 1930. The stone was used for monuments and interior and exterior construction.

Serpentine was quarried by the Westfield Marble Quarries (Inc.) at Westfield, Hampden County. All this stone is sold to manufacturers in rough blocks.

Michigan.—Development work was done and blocks of serpentine were quarried and sawed, polished, and distributed for samples by the Vertique Marble Co. at Ishpeming, Marquette County, in 1930, but no stone was marketed commercially.

Missouri.—The production of stone in the Carthage marble district at Carthage, Jasper County, is shown on page 364. This is the largest marble district in Missouri. The quarries are operated by the Carthage Marble Corporation, which ships stone in rough blocks and as sawed and finished stone chiefly for construction, but also for monumental work. Other companies operating marble quarries in Missouri are: The Logan Gray Quarries Co. (successor to the Carthage Stone Co.) (address, Carthage), producing stone for interior construction at South Greenfield, Dade County; The Phenix Marble Co. (address, Scarritt Building, Kansas City), Phenix, Greene County, which produced rough and finished stone for exterior and interior construction; the Joplin Marble Quarries Co., in Newton County, near Joplin, which produced rough blocks and finished stone for exterior and interior construction; and the Ozora Marble Quarries Co. (address, Paul Brown Building, St. Louis), St. Marys, Ste. Genevieve County, which produced rough blocks for interior work and terrazzo.

Montana.—The Vermont Marble Co. (address, Proctor, Vt.) did not ship any stone from its quarries near Townsend, Broadwater County, in 1930, although some stone was quarried.

New Jersey.—The Rock Products Co. (address, Easton, Pa.) produced serpentine for construction and terrazzo from the Lizzie Clay & Pulp Co. quarry at Phillipsburg, Warren County.

New York.—Marble quarries in New York are operated by the following companies:

Clinton County:
  Bluff Point—Vermont Marble Co. (address, Proctor, Vt.); for interior building.
  Plattsburg—Day Quarry Co.; stone sold in rough blocks for exterior building.
Dutchess County: Wingdale—South Dover Marble Co. (address, One hundred and thirty-third Street and Walnut Avenue, New York City); stone quarried and shipped in rough blocks for exterior construction.
Putnam County: Patterson—Tuckahoe & Patterson Marble Co.; crushed marble for stucco, artificial stone, etc.
St. Lawrence County:
  Gouverneur—
    DeKalb White Marble Co.; Clarkson quarry; stucco and manufacture of cast stone.
    Gouverneur Marble Co.; construction, monumental, and riprap.
Westchester County:
  Thornwood—Universal Marble Products Corporation; crushed marble for stucco and artificial stone.
  Tuckahoe—
    Benedict Stone Co. (address, 60 East Forty-second Street, New York City); stone crushed and sold for manufacture of cast and artificial stone, stucco, etc.
    Conlin Marble Co. (Inc.); product all sold as crushed or pulverized stone for terrazzo and stucco, as marble dust and flour, and for various other purposes.
    Kapailo Manufacturing Co. (address, Pershing Square Building, New York City); product crushed and sold for manufacture of cast and artificial stone, stucco, poultry grit, etc.

North Carolina.—Marble in the form of rough blocks was shipped in 1930 by the Carolina Marble Quarries (Inc.) (address, Andrews) from near Marble, Cherokee County.

Tennessee.—Marble quarries in Blount, Knox, Loudon, and Union Counties were operated in 1930 by the following:

Blount County:
  Friendsville—John J. Craig Co. (address, Knoxville); Craig quarry.
  Kiser—Andres Stone & Marble Co. (address, Milwaukee, Wis.).
  Louisville—Light Pink Marble Co.; "Anderson Pink" quarry.
Knox County:
  Knoxville—
    Appalachian Marble Co.
    Bond Marble Co.; "Bond Pink" quarry.
    John J. Craig Co.; Boyd quarry.
    Gray Knox Marble Co.; Gray Knox, Consolidated, and Asbury quarries.
    Knoxville-Gray Eagle Marble Co.; Knoxville and Gray Eagle quarries.
    Ross-Republic Marble Corporation; Ross quarry.
    Tennessee Producers Marble Co.; McMullen Gray quarry.
Loudon County: Oster—Virginia-Tennessee Marble Co. (address, Friendsville).
Union County:
  Luttrell—
    Knoxville-Gray Eagle Marble Co. (address, Knoxville); Luttrell quarry.
    Ross-Republic Marble Corporation (address, Knoxville); Republic quarry.

Utah.—The "Bird's-eye" quarry of the Mount Nebo Marble Co., at Thistle, Utah County, was operated by the Inter Mountain Marble Co., lessee (address, 239 Depot Avenue, Salt Lake City); the stone was shipped in rough blocks for construction.

Vermont.—Vermont furnishes high-grade marble for building and monumental work. Stone for terrazzo, stucco, paper mills, lime, and other industrial uses is also furnished by the marble quarries. The following firms operate marble quarries in Vermont:

Franklin County: Swanton—Vermont Marble Co. (address, Proctor); "Champlain Red" marble for interior work.
Grand Isle County: Isle La Motte—Vermont Marble Co. (address, Proctor); black marble for interior work; much of the product shipped to mills of this company at Proctor for finishing.
Rutland County:
  Brandon, Danby, Pittsford, Proctor, and West Rutland—Vermont Marble Co. (address, Proctor); marble for exterior and interior building, monuments, and mausoleums shipped from these quarries; greater part of the stone sold from the mills at Proctor as sawed or finished stone. Stone from the other quarries of this company also milled at Proctor and sold from there.
  Pittsford—Venetian Co. (address, Rutland); rough blocks for monumental work.
  West Rutland—
    Colonial Marble Corporation (address, Gryphon Building, Rutland); Eastman quarry; stone for interior and monumental work shipped in rough blocks and as finished stone.
    Green Mountain Marble Corporation (address, Rutland); Baronial, Clarendon, and Mine quarries; rough stone and dressed stone for exterior and interior building, mausoleums, and monuments sold from the quarries and mills of this company.
Washington County: Moretown and Roxbury—Vermont Marble Co. (address, Proctor); serpentine (verde antique) sold in rough blocks; also shipped to mills of the company, milled, and sold as finished stone.
Windsor County: Rochester—Vermont Marble Co. (address, Proctor); serpentine (verde antique) sold in rough blocks; also shipped to mills of the company, milled, and sold as finished stone.

Virginia.—In 1930 a small amount of black marble for interior construction and for terrazzo was taken from the quarries of the Rockingham Marble Corporation, Harrisonburg, Rockingham County.

Washington.—Deposits of serpentine near Chewelah and Valley, Stevens County, are operated intermittently for terrazzo, stucco, cast stone, etc. In 1930 sales of stone for these uses were reported by the Manufacturers Mineral Co., 1107 West Idaho Street, Seattle, and J. J. McGrath, Valley.

LIMESTONE

The output of limestone in 1930, as covered by the figures in this report, amounted to 88,741,440 short tons, valued at $100,002,114, a decrease of 12 per cent in both quantity and value from 1929. Crushed stone (56,775,060 tons, valued at $54,154,317), for use as road metal, concrete, and railroad ballast, which represented 64 per cent of the total limestone output, decreased 8 per cent in both quantity and value. Crushed stone for concrete and road metal (48,213,300 tons, valued at $47,788,979) decreased 4 per cent in quantity and 5 per cent in value; that for railroad ballast (8,561,760 tons, valued at $6,365,338) decreased 25 per cent in quantity and 28 per cent in value. Fluxing stone (17,021,350 tons, valued at $12,312,602), the next largest limestone product, decreased 30 per cent in quantity and 32 per cent in value. Limestone for construction (15,682,720 cubic feet, valued at $18,535,293) decreased 12 per cent in quantity and 10 per cent in value. Limestone sold for rubble (756,470 tons, valued at $623,100) showed a large increase in quantity but a decrease in value, because a considerable quantity of this class of stone with a low unit value was produced and was used in railroad work. Stone for riprap (2,918,110 tons, valued at $3,318,084) increased 40 per cent in quantity, largely on account of continued demand for stone for repair work along the Missouri and Mississippi Rivers necessitated by the floods of 1928. Stone for street work (curbing, flagging, and paving) decreased in output in 1930, as did that sold to sugar factories, glass factories, and paper mills, and for agricultural limestone and the total for "Other uses." Some of the products classed under "Other uses" increased notably, as indicated in the table on page 360.

Limestone sold or used by producers in the United States, 1929 and 1930, by uses

Use	1929		1930	
	Quantity	Value	Quantity	Value
Building stone [1] ---cubic feet--	17, 864, 700	$20, 649, 257	15, 682, 720	$18, 535, 293
Approximate equivalent in short tons------	1, 312, 820	-------------	1, 152, 780	-------------
Curbing, flagging, and paving------cubic feet--	471, 880	158, 266	346, 040	137, 801
Approximate equivalent in short tons------	37, 940	-------------	27, 760	-------------
Rubble---short tons--	352, 480	693, 678	756, 470	623, 100
Riprap---do----	2, 080, 580	2, 655, 374	2, 918, 110	3, 318, 084
Crushed stone---do----	61, 465, 200	58, 934, 450	56, 775, 060	54, 154, 317
Fluxing stone---do----	24, 337, 280	17, 994, 110	17, 021, 350	12, 312, 602
Sugar factories---do----	487, 990	874, 909	414, 340	733, 359
Glass factories---do----	257, 370	455, 367	224, 180	349, 771
Paper mills---do----	273, 880	456, 251	248, 790	377, 059
Agriculture---do----	2, 654, 580	3, 764, 775	2, 542, 100	3, 309, 329
Other uses [2]---do----	7, 426, 840	7, 269, 634	6, 660, 500	6, 151, 399
Total (quantities approximate, in short tons)---	100, 686, 960	113, 906, 071	88, 741, 440	100, 002, 114

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[1] Figures for building stone include small amounts of monumental stone.
[2] See table on p. 360 for further distribution of limestone products.

Ohio produced more limestone in 1930 than any other State, followed closely by Pennsylvania; New York and Michigan were the next largest producers. Indiana ranks first in value of limestone production on account of its output of high-grade building stone. The following table shows the production by States:

Limestone sold or used by producers in the United States, 1929 and 1930, by States

[Quantities approximate]

State	1929		1930	
	Short tons	Value	Short tons	Value
Alabama	1, 190, 770	$1, 771, 201	905, 760	$1, 537, 680
Arizona	162, 020	147, 619	75, 390	61, 417
Arkansas	132, 760	170, 287	314, 250	373, 059
California	261, 280	653, 681	296, 180	587, 387
Colorado	438, 980	458, 983	332, 310	324, 851
Connecticut	37, 030	112, 891	35, 210	103, 359
Florida	2, 258, 130	1, 669, 245	1, 796, 670	1, 490, 173
Georgia	401, 320	488, 700	315, 850	378, 060
Hawaii	2, 670	9, 352	2, 720	9, 108
Idaho	29, 820	70, 623	19, 320	25, 099
Illinois	8, 345, 080	6, 965, 264	7, 538, 810	5, 909, 089
Indiana	5, 129, 220	22, 191, 883	4, 515, 460	19, 245, 409
Iowa	1, 624, 400	1, 549, 743	1, 813, 860	1, 850, 832
Kansas	1, 392, 230	1, 413, 146	1, 248, 670	1, 245, 088
Kentucky	2, 443, 880	2, 558, 068	2, 625, 080	2, 602, 022
Louisiana	(1)	(1)	(1)	(1)
Maine	83, 980	130, 125	101, 950	128, 892
Maryland	346, 810	470, 246	549, 320	723, 065
Massachusetts	83, 930	303, 795	78, 730	276, 501
Michigan	13, 572, 010	8, 425, 261	10, 432, 950	6, 596, 713
Minnesota	280, 690	830, 122	300, 000	840, 860
Mississippi	(1)	(1)	(1)	(1)
Missouri	4, 093, 430	5, 704, 241	3, 654, 920	4, 819, 475
Montana	134, 490	140, 164	94, 050	114, 819
Nebraska	178, 200	335, 789	103, 120	188, 674
Nevada	33, 400	51, 805	30, 120	46, 850
New Jersey	166, 750	368, 504	176, 920	386, 451
New Mexico	(1)	(1)	(1)	(1)
New York	11, 105, 850	13, 841, 827	11, 185, 920	13, 892, 218
North Carolina	101, 180	202, 416	(1)	(1)
Ohio	14, 241, 690	11, 789, 747	12, 482, 760	9, 285, 089
Oklahoma	2, 074, 990	1, 552, 178	1, 942, 750	1, 505, 716
Oregon	23, 800	58, 442	(1)	(1)
Pennsylvania	14, 525, 080	14, 024, 287	12, 100, 700	12, 375, 067
Porto Rico	55, 960	90, 675	37, 760	85, 324
Rhode Island	380	1, 171	300	758
South Dakota	40, 590	55, 513	36, 770	39, 705
Tennessee	2, 249, 440	2, 304, 002	1, 640, 530	1, 688, 763
Texas	3, 238, 760	2, 390, 235	2, 007, 160	1, 646, 694
Utah	203, 530	224, 097	631, 420	368, 992
Vermont	42, 360	129, 251	39, 360	114, 053
Virginia	2, 516, 120	2, 481, 192	2, 925, 560	2, 866, 938
Washington	75, 440	129, 423	119, 140	165, 809
West Virginia	3, 301, 160	2, 978, 873	3, 008, 880	2, 653, 954
Wisconsin	3, 441, 070	3, 882, 645	2, 712, 640	2, 677, 898
Wyoming	322, 260	473, 678	207, 380	343, 637
Undistributed	304, 020	305, 681	304, 790	426, 566
	100, 686, 960	113, 906, 071	88, 741, 440	100, 002, 114

[1] Included under "Undistributed."

Limestone sold or used by producers in the United States in 1930, by States and uses

State	Number of active plants	Building						Rubble		Riprap		Crushed stone			
		Rough construction		Rough architectural		Finished (sawed and cut)						Concrete and road metal		Railroad ballast	
		Short tons	Value	Cubic feet	Value	Cubic feet	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	13			(1)	(1)	(1)	(1)			46, 530	$31, 425	42, 280	$38, 512	105, 010	$59, 845
Arizona	6									2, 070	419	29, 730	29, 705		
Arkansas	8									10, 190	10, 211	183, 530	268, 493	109, 560	78, 728
California	27	350	$645							1, 160	1, 000	97, 310	117, 554	11, 180	12, 206
Colorado	12			(1)	(1)							(1)	(1)		
Connecticut	4											3, 380	6, 724		
Florida	25			3, 660	$3, 400	69, 210	$223, 576					1, 538, 520	1, 020, 270	252, 310	240, 591
Georgia	9											258, 390	212, 072		
Hawaii	1														
Idaho	4														
Illinois	81	(1)	(1)	(1)	(1)	(1)	(1)	3, 440	$5, 199	820, 090	763, 624	4, 637, 390	3, 355, 031	475, 720	346, 032
Indiana	91	(1)	(1)	5, 388, 430	2, 633, 140	7, 314, 550	13, 553, 032	154, 470	72, 891	108, 790	43, 281	2, 715, 640	2, 438, 387	249, 760	167, 882
Iowa	48	3, 890	3, 904					6, 170	6, 885	98, 780	85, 704	1, 160, 390	1, 297, 836	242, 310	215, 148
Kansas	46	4, 680	7, 788			(1)	(1)	4, 800	5, 130	112, 140	157, 418	669, 860	640, 309	428, 560	374, 093
Kentucky	65	4, 370	7, 336	78, 890	68, 792			3, 440	6, 564	86, 230	105, 603	1, 773, 720	1, 828, 442	634, 340	465, 689
Louisiana	1											(1)	(1)	(1)	(1)
Maine	4									4, 460	2, 855				
Maryland	24	24, 420	30, 575					1, 800	1, 443			506, 180	644, 376	6, 580	5, 171
Massachusetts	9											(1)	(1)		
Michigan	24							(1)	(1)	(1)	(1)	1, 242, 210	902, 282	202, 310	80, 316
Minnesota	15	(1)	(1)	91, 490	98, 047	139, 360	411, 262	6, 360	13, 269	30, 580	20, 280	221, 110	242, 534		
Mississippi	2														
Missouri	112							160, 600	250, 923	1, 001, 620	1, 498, 149	2, 200, 250	2, 694, 023	35, 500	44, 130
Montana	8									(1)	(1)	16, 430	18, 277		
Nebraska	5									32, 430	33, 382	36, 810	37, 523		
Nevada	3	(1)	(1)									(1)	(1)		
New Jersey	5											65, 900	86, 681		
New Mexico	1											(1)	(1)		
New York	77	14, 700	19, 831			(1)	(1)	8, 540	30, 802	19, 270	23, 897	8, 676, 010	11, 084, 125	862, 050	775, 071
North Carolina	3											(1)	(1)		
Ohio	146	3, 510	3, 887					7, 480	12, 883	2, 240	1, 898	8, 080, 420	6, 178, 414	1, 333, 000	876, 752
Oklahoma	16	(1)	(1)					(1)	(1)	14, 440	9, 646	1, 220, 070	1, 083, 358	701, 730	404, 109
Oregon	2													(1)	(1)
Pennsylvania	219	31, 950	40, 699			(1)	(1)	(1)	(1)	(1)	(1)	5, 933, 020	6, 978, 970	145, 210	145, 756
Porto Rico	12	2, 500	3, 800					(1)	(1)			29, 520	59, 386	(1)	(1)
Rhode Island	1														
South Dakota	5									(1)	(1)	26, 580	33, 425		

[1] Included under "Undistributed."

Limestone sold or used by producers in the United States in 1930, by States and uses—Continued

State	Number of active plants	Building						Rubble		Riprap		Crushed stone			
		Rough construction		Rough architectural		Finished (sawed and cut)						Concrete and road metal		Railroad ballast	
		Short tons	Value	Cubic feet	Value	Cubic feet	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Tennessee	35	1,380	$1,920							17,130	$15,875	1,097,190	$1,086,699	374,030	$291,299
Texas	31	300	600	76,500	$29,468	122,160	$241,385	1,120	$2,058	19,590	16,601	918,810	766,760	792,440	521,017
Utah	13			(1)	(1)			230,270	60,703	41,610	11,724	470	291	180,190	109,575
Vermont	7											19,800	38,998		
Virginia	75	(1)	(1)					(1)	(1)			1,421,670	1,400,458	844,950	707,618
Washington	6	(1)	(1)									1,000	4,000	50	38
West Virginia	29											635,130	656,702	506,910	375,990
Wisconsin	99	9,350	40,300	48,110	25,642	62,250	135,663	65,530	89,261	51,630	53,647	2,482,220	2,134,450	350	310
Wyoming	7	880	4,854							(1)	(1)	52,970	92,240	(1)	(1)
Undistributed		29,130	28,411	447,170	419,857	229,240	497,479	102,450	65,089	397,130	431,445	219,390	311,672	67,710	67,972
	1,436	131,410	194,550	6,134,250	3,278.346	7,936,770	15,062,397	756,470	623,100	2,918,110	3,318,084	48,213,300	47,788,979	8,561,760	6,365,338

State	Fluxing stone		Sugar factories		Glass factories		Paper mills		Agriculture		Other uses		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons (approximate)	Value
Alabama	644,320	$511,971							(1)	(1)	9,270	$32,921	905,760	$1,537,680
Arizona	43,540	31,243									50	50	75,390	61,417
Arkansas									4,810	$5,827	6,160	9,800	314,250	373,059
California	33,540	60,937	44,710	$132,647	11,620	$30,452			6,100	20,750	90,210	211,196	296,180	587,387
Colorado	262,880	214,257	65,840	97,539									332,310	324,851
Connecticut									12,980	45,386	18,850	51,249	35,210	103,359
Florida									(1)	(1)	(1)	(1)	1,796,670	1,490,173
Georgia									26,020	34,163	31,440	131,825	315,850	378,060
Hawaii									2,720	9,108			2,720	9,108
Idaho	(1)	(1)	(1)	(1)					4,470	7,608	10,600	10,693	19,320	25,099
Illinois	604,890	537,829			(1)	(1)			868,430	740,785	120,760	143,859	7,538,810	5,909,089
Indiana	98,300	19,594			(1)	(1)			138,450	143,997	68,770	90,875	4,515,460	19,245,409
Iowa	6,690	10,055	1,530	2,289	24,000	29,910			268,720	197,788	1,380	1,313	1,813,860	1,850,832
Kansas									20,800	15,802	(1)	(1)	1,248,670	1,245,088
Kentucky	70	158							112,620	98,561	4,570	20,877	2,625,080	2,602,022

Louisiana													(1)	(1)
Maine	37,170	40,270					28,630	$48,248	750	3,913	30,940	33,606	101,950	128,892
Maryland	320	319							(1)	(1)	(1)	(1)	549,320	723,065
Massachusetts	8,480	13,803					(1)	(1)	51,130	209,213	13,070	44,849	78,730	276,501
Michigan	5,161,490	3,237,042	33,800	50,700	(1)	(1)	60,670	104,277	126,670	131,632	3,126,840	1,603,693	10,432,950	6,596,713
Minnesota	(1)	(1)							15,450	13,909	7,710	40,151	300,000	840,860
Mississippi									(1)	(1)			(1)	(1)
Missouri	14,780	15,451	5,250	4,738	20,950	35,083			101,900	112,532	114,070	164,446	3,654,920	4,819,475
Montana	(1)	(1)	27,140	46,652							(1)	(1)	94,050	114,819
Nebraska	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)	14,870	86,763	103,120	188,674
Nevada	(1)	(1)	(1)	(1)							(1)	(1)	30,120	46,850
New Jersey	(1)	(1)							(1)	(1)	35,490	142,572	176,920	386,451
New Mexico													(1)	(1)
New York	130,100	115,075					(1)	(1)	83,710	297,327	1,375,820	1,508,233	11,185,920	13,892,218
North Carolina	(1)	(1)							(1)	(1)			(1)	(1)
Ohio	2,336,240	1,467,650	15,400	21,160	49,670	73,373	4,330	4,821	193,120	214,109	457,350	430,142	12,482,760	9,285,089
Oklahoma									(1)	(1)	(1)	(1)	1,942,750	1,505,716
Oregon							(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Pennsylvania	5,483,150	4,198,246			46,810	79,090			82,900	241,206	349,480	649,373	12,100,700	12,375,067
Porto Rico							(1)	(1)	4,420	20,985	750	375	37,760	85,324
Rhode Island	190	550									110	208	300	758
South Dakota			(1)	(1)									36,770	39,705
Tennessee	14,130	12,011							109,620	183,674	27,050	97,285	1,640,530	1,688,763
Texas	25,550	27,036			1,590	1,591			680	643	232,980	39,535	2,007,160	1,646,694
Utah	139,100	111,306	33,140	67,918							(1)	(1)	631,420	368,992
Vermont	(1)	(1)					(1)	(1)	12,470	53,909	6,770	20,672	39,360	114,053
Virginia	139,360	120,665	(1)	(1)			(1)	(1)	119,530	175,286	372,490	434,274	2,925,560	2,866,938
Washington	21,900	19,734	(1)	(1)			92,210	129,169	2,000	4,560	970	5,510	119,140	165,809
West Virginia	1,738,860	1,470,450			2,180	2,069			23,090	53,333	102,710	95,410	3,008,880	2,653,954
Wisconsin	(1)	(1)					(1)	(1)	59,630	85,671	33,400	111,255	2,712,640	2,677,898
Wyoming	(1)	(1)	145,740	244,095									207,380	343,637
Undistributed	76,300	76,950	41,790	65,621	67,360	98,203	62,950	90,544	88,910	187,652	23,330	76,190	304,790	426,566
	17,021,350	12,312,602	414,340	733,359	224,180	349,771	248,790	377,059	2,542,100	3,309,329	6,688,260	6,289,200	88,741,440	100,002,114

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[1] Included under "Undistributed."

Limestone sold or used by producers in the United States for miscellaneous uses, 1929 and 1930

Use	1929		1930	
	Short tons	Value	Short tons	Value
Alkali works	5,004,930	$3,234,457	4,436,160	$2,759,245
Asphalt filler	344,880	1,165,538	430,290	1,122,939
Calcium carbide works	339,510	236,412	364,750	275,296
Carbonic acid works	4,560	10,708	2,290	5,700
Coal-mine dusting	34,650	121,712	47,750	132,985
Fertilizer filler	3,910	8,656	12,240	21,194
Filter beds	72,870	63,277	30,860	23,633
Magnesia works (dolomite)	84,750	129,383	111,740	189,219
Mineral food	25,270	96,009	30,350	96,216
Mineral (rock) wool	83,920	92,092	64,850	70,988
Poultry grit	34,600	221,610	45,920	197,327
Refractory stone (dolomite)	516,400	461,444	453,350	356,025
Road base	494,250	213,802	139,030	34,106
Roofing gravel	4,950	10,968	1,740	5,154
Stucco, terrazzo, and artificial stone	85,540	292,313	59,570	208,990
Whiting substitute	125,430	626,692	119,350	492,894
Other uses [1]	166,420	284,561	310,260	159,488
	7,426,840	7,269,634	6,660,500	6,151,399

[1] Includes stone for ammonia, baking powder, lime burners, nitrates, phosphates, powder, purification of copper, reduction of aluminum ore, soap, sulphuric acid, and uses not specified.

A considerable quantity of the limestone reported in the tables by uses is burned into lime—particularly the limestone reported by iron and steel producers and by alkali, sugar, and paper manufacturers, as quarried by them and used in their own plants, and limestone sold to manufacturers of these and other commodities, who may burn it into lime before using it. To avoid duplication, this Lime is not included in the figures of production in the chapter on Lime. Limestone manufactured into lime and into cement and reported in terms of finished product is treated in separate chapters. The quantities so used are estimated in the following table:

Limestone used for all purposes in the United States, 1926–1930, in short tons

Use	1926	1927	1928	1929	1930
Limestone (as given in this report)	91,887,900	99,662,270	96,864,650	100,686,960	88,741,440
Portland cement (including "cement rock")	41,583,000	43,800,000	44,600,000	43,200,000	40,500,000
Natural cement ("cement rock")	391,000	395,000	412,000	412,000	341,000
Lime	9,121,000	8,830,000	8,920,000	8,540,000	6,780,000
	142,982,900	152,687,270	150,796,650	152,838,960	136,362,440

BUILDING STONE

Of the total quantity (30,169,270 cubic feet) of building stone reported in 1930, 52 per cent (15,682,720 cubic feet) was limestone; the latter decreased 12 per cent in quantity from 1929. The high-grade limestone classed as architectural building stone and sold entirely as dimension stone is obtained from a few well-known localities. Such figures as are available, covering the output of these districts for a series of years, are given in the tables that follow.

Alabama.—Oolitic limestone used as high-grade building stone is quarried at Rockwood, near Russellville, Franklin County, by the Alabama-Oolitic Stone Co., Cedar Creek quarry (address, First National Bank Building, Nashville, Tenn.), and the Rockwood Alabama Stone Co., Rockwood, Aday and Spout Springs quarries (address, Fuller Building, New York City).

Colorado.—Limestone (travertine) sold in rough blocks for architectural building is quarried in Fremont County, near Salida (Wellsville quarry), by the Colorado Travertine Co. (address, Continental Oil Building, Denver).

Florida.—The Florida Travertine Corporation quarried and shipped stone ("Floridene") from quarries near Bradenton, Manatee County. This is the second year of operation for these quarries; the stone is shipped, as rough blocks, sawed, and cut stone for exterior and interior construction, for building and ornamental purposes. Stone is also quarried and shipped from Quarry Key, Windlys Island, Monroe County, by C. Ed. de Brauwere Co. (address, Miami).

Indiana.—The largest quarry center for building stone in the United States is the oolitic limestone district near Bedford, Lawrence County, and Bloomington, Monroe County, Ind. In 1930 the output of building stone in this district (12,308,340 cubic feet, valued at $15,276,487) decreased 12 per cent in both quantity and value from 1929. The quarry operators in the district in 1930 and their addresses were as follows:

The Carl Furst Co., Indiana Limestone Co., and Reed-Powers Cut Stone Cc., Bedford; Bloomington Limestone Co., Empire Stone Co., Hoadley Bros. (Inc.), B. G. Hoadley Quarries (Inc.), Hunter Bros. Stone Co., Independent Limestone Co., Indian Hill Stone Co., Monon Stone Co., Sare-Hoadley Stone Co., Shawnee Stone Co., and H. A. Woolery & Son, Bloomington; Perry Stone Co., Ellettsville; and Victor Oolitic Stone Co., Victor.

Other operators of high-grade building stone quarries in Indiana in 1930 were the Ingalls Stone Co. (address, Bedford), Romona, Owen County, and The St. Paul Stone Quarries Co., St. Paul, Decatur County.

The statistics of production for the Bedford-Bloomington district for a series of years follow.

Limestone sold by producers in the Bedford-Bloomington district, Lawrence and Monroe Counties, Ind., 1921–1930

Year	Construction		Other		Total	
	Cubic feet	Value	Short tons	Value	Short tons (approximate)	Value
1921	5,297,458	$6,815,859	141,068	$146,425	525,000	$6,962,284
1922	9,616,670	11,288,823	214,722	139,233	912,000	11,428,056
1923	11,694,380	15,248,164	233,180	167,845	1,081,080	15,416,009
1924	11,005,570	14,164,241	255,930	200,512	1,053,730	14,364,753
1925	11,803,890	14,203,120	290,990	170,772	1,146,790	14,373,892
1926	14,171,490	18,063,148	405,630	354,703	1,432,480	18,417,851
1927	13,572,950	16,407,170	423,320	381,455	1,407,360	16,788,625
1928	14,520,260	17,760,622	429,890	302,819	1,482,610	18,063,441
1929	14,009,850	17,419,183	414,140	250,578	1,429,840	17,669,761
1930	12,308,340	15,276,487	538,490	364,365	1,430,840	15,640,852

Limestone sold by producers in the Bedford-Bloomington district, Lawrence and Monroe Counties, Ind., 1929 and 1930, by classes

Class	1929		1930	
	Quantity	Value	Quantity	Value
Construction:				
Rough blocks cubic feet	5,345,390	$2,931,816	5,384,090	$2,629,943
Sawed do	4,361,670	3,697,731	3,261,000	2,719,630
Semifinished do	174,390	375,720	161,890	271,630
Cut do	4,128,400	10,413,916	3,501,360	9,655,284
Total construction do	14,009,850	17,419,183	12,308,340	15,276,487
Other stone short tons	414,140	250,578	538,490	364,365
Grand total (quantities approximate, in short tons)	1,429,840	17,669,761	1,430,840	15,640,852

Considerable stone is sold by quarry operators to the finishing mills of the district, and a few of the quarry operators who operate mills obtain rough stone from other quarries, mill it, and resell it. Duplication is avoided by including this milled product in the table showing the output of the mills in the district, whereas the rough stone involved is included in the quarry report of the producing company. The names and addresses of mills in the Bedford-Bloomington district operating in 1930 on stone purchased from quarry operators were as follows: Bedford Cut Stone Co., The Ed. Edinger Co., J. P. Falt Co., Heltonville Limestone Co., Ingalls Stone Co., Alexander King Stone Co., and John A. Rowe Rustic Monumental Works, Bedford; J. M. Hoadley (Inc.), John Hoadley Stone Co., Matthews Bros. Co., Mutual Oolitic Stone Co., Walker Bros. Stone Co., and Wallis Stone Co., Bloomington; Harding & Cogswell (Inc.), Perry Stone Co., and A. J. Thompson Stone Co., Ellettsville; and Swenson Stone Co., Stinesville. Some of the above companies are also owners of quarries that were idle in 1930, their mills being supplied by stone obtained from active quarry operators.

Indiana oolitic limestone sold by mills not operated by quarry companies in the Bedford-Bloomington district, Lawrence and Monroe Counties, Ind., 1921–1930 [1]

Year	Cubic feet	Value	Year	Cubic feet	Value
1921	1,030,177	$2,691,931	1926	1,511,250	$4,073,271
1922	1,508,100	3,706,900	1927	1,670,470	3,646,445
1923	1,676,500	4,805,537	1928	1,177,320	2,594,224
1924	1,754,500	4,654,145	1929	1,370,200	3,374,490
1925	2,087,860	5,629,269	1930	1,991,000	4,645,824

[1] Includes some stone purchased by quarry operators and milled and resold.

Indiana oolitic limestone sold by mills not operated by quarry companies in the Bedford-Bloomington district, Lawrence and Monroe Counties, Ind., 1929 and 1930, by classes [1]

Year	Sawed		Semifinished		Cut		Total	
	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value
1929	[2] 208,660	[2] $148,777	(2)	(2)	1,161,540	$3,225,713	1,370,200	$3,374,490
1930	197,990	124,946			1,793,010	4,520,878	1,991,000	4,645,824

[1] Includes some stone purchased by quarry operators and milled and resold.
[2] Semifinished stone included under sawed stone.

Kansas.—The Arkansas City Sand & Gravel Co. (address, Arkansas City, Kans.) produces stone for rough and sawed architectural work from quarries near Silverdale, Cowley County.

Kentucky.—The oolitic limestone quarried at Bowling Green, Warren County, Ky., is well known to the trade. It is quarried for building and monumental stone by the Bowling Green Quarries Co. and by William Murphy. There are also several quarries in the vicinity operated for crushed stone. The following table shows the production of the county for the past 10 years:

Limestone sold by producers in Warren County, Ky., 1921–1930

Year	Building and monumental stone (rough and dressed)		Other		Total	
	Cubic feet	Value	Short tons	Value	Short tons (approximate)	Value
1921	128,000	$170,540	6,230	$5,840	16,800	$176,380
1922	91,400	143,012	5,200	7,000	12,740	150,012
1923	65,980	113,040	24,380	28,915	29,660	141,955
1924	65,630	120,882	10,000	10,000	14,920	130,882
1925	128,700	226.646	27,200	61,260	37,500	287,906
1926	[1] 134,460	[1] 63,458	10,340	10,130	21,000	73,588
1927	[1] 198,770	[1] 119,054	73,350	86,400	87,660	205,454
1928	[1] 116,180	[1] 82,648	52,920	80,896	61,290	163,544
1929	[1] 30,620	[1] 27,251	7,000	10,500	9,200	37,751
1930	[1] 73,660	[1] 67,274	24,830	34,115	30,130	101,389

[1] Rough blocks only.

Minnesota.—The following table shows the sales of limestone at Mankato and Kasota, Minn., for the past 10 years:

Limestone sold by producers at Mankato and Kasota, Minn., 1921–1930

Year	Building stone (rough and dressed)		Other		Total	
	Cubic feet	Value	Short tons	Value	Short tons (approximate)	Value
1921	111,487	$271,230	32,627	$41,409	41,500	$312,639
1922	151,110	261,275	29,910	32,329	42,600	293,604
1923	138.890	312.911	33.980	34,867	44,900	347,778
1924	130,660	495,036	46.610	43,152	65,560	538,188
1925	320,050	586,451	66,060	60,179	91,380	646,630
1926	245,330	638,284	58,050	32,655	77,410	670,939
1927	199.640	414,350	41,990	26,766	57,760	441,116
1928	184,610	339.291	30,900	19,850	45,560	359,141
1929	230,290	495,895	38,410	22,962	56,590	518.857
1930	241,400	451,683	50,170	42,193	68,420	493,876

T. R. Coughlan Co. and The Mankato Lime Co., Mankato, and Babcock & Wilcox and Breen Stone & Marble Co., Kasota, are the producers of the Mankato and Kasota stone. The Biesanz Stone Co. quarries architectural building stone at Winona. This stone is marketed as "Travertine."

Missouri.—The stone quarried at Carthage, Jasper County, and used for architectural building and monumental stone is classed as marble and is included in the figures of production of marble in

Missouri given on page 351. Its chief use, however, like that of Indiana stone, is mainly for exterior building; the figures of production are given here for convenience in comparison. The crushed stone and low-grade material are included under limestone. All grades are combined here to show the total production. The Carthage Marble Corporation operates the dimension-stone quarries. Names of operators of other marble quarries in Missouri may be found on page 353. In common with other districts producing high-grade stone, the Carthage district showed considerable falling off in production in 1930 compared with 1929.

Limestone and marble sold by producers in the Carthage district, Jasper County, Mo., 1921–1930

Year	Building stone (rough and dressed)		Monumental stone (rough and dressed)		Other		Total	
	Cubic feet	Value	Cubic feet	Value	Short tons	Value	Short tons (approximate)	Value
1921	279, 560	$587, 301	31, 551	$77, 421	46, 751	$152, 521	72, 600	$817, 243
1922	368, 400	692, 693	26, 330	40, 471	68, 550	176, 852	102, 300	910, 016
1923	442, 680	782, 796	20, 630	32, 243	66, 070	167, 357	104, 760	982, 396
1924	435, 810	826, 294	25, 660	40, 505	78, 030	193, 944	116, 560	1, 060, 743
1925	478, 210	1, 012, 930	38, 810	85, 321	224, 270	304, 913	267, 450	1, 403, 164
1926	426, 950	975, 754	32, 630	80, 698	127, 330	220, 780	165, 700	1, 277, 232
1927	339, 260	724, 265	10, 740	17, 429	93, 480	151, 795	122, 710	893, 489
1928	450, 670	1, 009, 927	14, 720	23, 231	118, 130	182, 171	156, 890	1, 215, 329
1929	278, 340	553, 468	21, 610	43, 202	174, 810	228, 941	199, 860	825, 611
1930	158, 270	436, 593	8, 200	14, 253	133, 830	109, 912	147, 730	560, 758

New York.—Onondaga limestone for building stone is quarried near Syracuse, Onondaga County, by the Jones Cut Stone Co.

Texas.—Activity which developed during 1929 in the building-stone quarries in Texas was continued in 1930 and the following companies operated building-stone quarries during the year:

- Jones County:
  - Lueders—
    - Bedford Carthage Stone Corporation (address, Houston).
    - A. C. Fox.
    - Lueders Building Stone Co. (Post Oak quarry).
- Kinney County: Brackettville—Del Rio Stone Co. (address, Marine Bank Building, Houston).
- Shackelford County: Albany—A. C. Fox (address, Lueders); new quarry opened in 1930.
- Williamson County:
  - Cedar Park—
    - E. Cluck.
    - Texas Quarries (Inc.) (address, Austin).

The combined output of these quarries may be noted in the table on page 358.

Utah.—A small amount of oolitic limestone is produced annually near Ephraim, Sanpete County, by the Parry Bros. Stone Co. (address, Manti) and the San Pete White Stone Co.

Wisconsin.—Limestone for building, in the form of dimension stone, was produced in Wisconsin in 1930 by the following:

Milwaukee County: Wauwatosa—F. Hartung Co.
Waukesha County:
    Lannon—
        Davis Bros. Stone Co.
        Lannon Quarries Corporation (address, Beaver Dam).
        Schneider Stone Co.
        Wisconsin Lannon Stone Co. (address, Milwaukee).

The combined output of these quarries may be noted in the table on page 358.

A considerable amount of limestone used for curbing and flagstone is also produced from quarries in this State.

SANDSTONE

The output of sandstone in 1930 amounted to 4,594,310 short tons, valued at $10,285,391, a decrease of 21 per cent in quantity and 7 per cent in value from 1929. The amount of stone sold for construction, paving blocks, and flagstones increased, but that sold for crushed stone, riprap, refractory use, curbing, rubble, and miscellaneous uses decreased.

Sandstone sold or used by producers in the United States, 1929 and 1930, by uses

Use	1929		1930	
	Quantity	Value	Quantity	Value
Building stone ..... cubic feet	4, 870, 670	$2, 666, 314	4, 953, 660	$3, 395, 837
Approximate equivalent in short tons	347, 440	------	383, 160	------
Paving blocks ..... number	3, 674, 800	291, 608	4, 337, 870	321, 486
Approximate equivalent in short tons	40, 890	------	49, 500	------
Curbing ..... cubic feet	2, 092, 210	1, 668, 541	1, 693, 043	1, 360, 643
Approximate equivalent in short tons	167, 660	------	124, 220	------
Flagging ..... cubic feet	729, 230	557, 720	774, 920	615, 439
Approximate equivalent in short tons	55, 770	------	58, 770	------
Crushed stone ..... short tons	3, 171, 750	3, 298, 779	2, 640, 630	2, 770, 908
Rubble ..... do	43, 840	102, 524	28, 420	61, 586
Riprap ..... do	864, 380	1, 092, 870	526, 560	642, 823
Refractory stone (ganister) ..... do	1, 004, 400	1, 200, 634	718, 370	952, 462
Other uses ..... do	94, 070	144, 991	64, 680	164, 207
Total (quantities approximate, in short tons)	5, 790, 200	11, 023, 981	4, 594, 310	10, 285, 391

Sandstone sold or used by producers in the United States, 1929 and 1930, by States

[Quantities approximate]

State	1929		1930	
	Short tons	Value	Short tons	Value
Alabama	30,450	$34,881	25,280	$27,441
Arizona	(1)	(1)	(1)	(1)
Arkansas	(1)	(1)	127,400	176,101
California	897,020	886,530	815,040	789,261
Colorado	36,520	51,268	24,240	67,229
Connecticut	(1)	(1)	15,730	87,123
Idaho	(1)	(1)	(1)	(1)
Illinois	62,650	37,944	52,110	30,208
Indiana	----------	----------	(1)	(1)
Kansas	27,660	48,000	(1)	(1)
Kentucky	3,660	29,524	3,590	33,347
Maryland	(1)	(1)	27,760	43,564
Massachusetts	(1)	(1)	(1)	(1)
Michigan	14,220	29,441	9,680	17,924
Minnesota	20,640	52,967	55,850	112,278
Mississippi	----------	----------	(1)	(1)
Missouri	196,830	322,508	196,740	288,120
Montana	790	1,186	210	315
New Jersey	(1)	(1)	16,990	19,893
New Mexico	(1)	(1)	(1)	(1)
New York	[2] 317,880	[2] 1,120,552	[2] 218,980	[2] 1,056,611
North Carolina	(1)	(1)	(1)	(1)
Ohio	479,580	3,118,276	433,780	2,944,254
Oklahoma	3,840	2,110	(1)	(1)
Oregon	481,990	534,847	190,990	224,029
Pennsylvania	[2] 1,696,290	[2] 2,767,864	[2] 1,486,210	[2] 2,935,385
South Dakota	193,470	274,482	91,550	218,908
Tennessee	(1)	(1)	6,980	97,805
Virginia	159,930	168,785	143,310	195,697
Washington	233,550	325,109	223,020	290,794
West Virginia	74,430	77,301	53,250	61,867
Wisconsin	208,070	365,656	171,860	296,047
Wyoming	----------	----------	(1)	(1)
Undistributed	650,730	774,750	203,760	271,190
	5,790,200	11,023,981	4,594,310	10,285,391

(1) Included under "Undistributed."

[2] Includes bluestone.

Sandstone sold or used by producers in the United States in 1930, by States and uses

State	Number of active plants	Building stone						Refractory stone (ganister)		Paving blocks		Curbing	
		Rough construction		Rough architectural		Dressed (sawed and cut)							
		Short tons	Value	Cubic feet	Value	Cubic feet	Value	Short tons	Value	Number	Value	Cubic feet	Value
Alabama	3							25,280	$27,441				
Arizona	2												
Arkansas	3												
California	19	2,400	$10,600			1,300	$6,000	7,500	20,000			110	$75
Colorado	9			2,240	$1,802	4,000	30,000	17,640	26,499	8,700	$658	130	129
Connecticut	3	(1)	(1)	(1)	(1)	(1)	(1)						
Idaho	1					(1)	(1)						
Illinois	3							440	2,437				
Indiana	1			(1)	(1)	(1)	(1)						
Kansas	2												
Kentucky	3					(1)	(1)						
Maryland	5	(1)	(1)					9,770	13,071				
Massachusetts	2			(1)	(1)	(1)	(1)						
Michigan	1												
Minnesota	4			(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)		
Mississippi	2												
Missouri	3												
Montana	1							210	315				
New Jersey	1	6,990	4,893										
New Mexico	2												
New York	47	31,570	21,740	129,990	87,565	84,470	235,261			1,420,990	84,162	380,573	377,414
North Carolina	2	(1)	(1)			(1)	(1)						
Ohio	15	16,400	59,000	389,390	332,915	549,940	1,107,084	17,210	51,624			1,186,000	875,646
Oklahoma	3												
Oregon	4	(1)	(1)										
Pennsylvania	66	4,770	8,380	136,910	156,068	178,580	623,013	483,160	600,100	2,704,180	203,710	126,230	107,379
South Dakota	8	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)		
Tennessee	6	(1)	(1)			(1)	(1)	(1)	(1)				
Virginia	5			(1)	(1)	(1)	(1)						
Washington	16	12,600	13,286			22,490	92,064						
West Virginia	12							(1)	(1)				
Wisconsin	15	(1)	(1)	4,310	4,905	5,940	11,240	137,590	181,096				
Wyoming	2			(1)	(1)								
Undistributed		181,930	234,021	70,880	85,740	126,120	270,260	19,570	29,879	204,000	32,956		
	271	256,660	351,920	733,720	668,995	972,840	2,374,922	718,370	952,462	4,337,870	321,486	1,693,043	1,360,643

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[1] Included under "Undistributed."

Sandstone sold or used by producers in the United States in 1930, by States and uses—Continued

State	Flagging		Rubble		Riprap		Crushed stone				Other uses		Total	
							Concrete and road metal		Railroad ballast					
	Cubic feet	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons (approximate)	Value
Alabama													25,280	$27,441
Arizona					(1)	(1)							(1)	(1)
Arkansas							127,400	$176,101					127,400	176,101
California	25,260	$12,536			26,420	$60,589	724,400	625,217	51,950	$52,444	150	$1,800	815,040	789,261
Colorado	3,000	1,056	1,580	$2,762	(1)	(1)	(1)	(1)					24,240	67,229
Connecticut	(1)	(1)			(1)	(1)	(1)	(1)					15,730	87,123
Idaho	(1)	(1)	(1)	(1)									(1)	(1)
Illinois							51,470	27,371			200	400	52,110	30,208
Indiana	(1)	(1)	(1)	(1)									(1)	(1)
Kansas	(1)	(1)					(1)	(1)					(1)	(1)
Kentucky	(1)	(1)			(1)	(1)	(1)	(1)					3,590	33,347
Maryland	12,280	4,734					16,590	24,879			(1)	(1)	27,760	43,564
Massachusetts							(1)	(1)					(1)	(1)
Michigan							9,680	17,924					9,680	17,924
Minnesota					(1)	(1)	47,480	70,802			(1)		55,850	112,278
Mississippi			(1)	(1)	(1)	(1)							(1)	(1)
Missouri					(1)	(1)			(1)	(1)			196,740	288,120
Montana													210	315
New Jersey					10,000	15,000							16,990	19,893
New Mexico					(1)	(1)			(1)	(1)			(1)	(1)
New York	111,170	82,982	400	1,100	18,180	11,306	91,330	149,081			5,700	6,000	218,980	1,056,611
North Carolina													(1)	(1)
Ohio	429,690	304,539	10,430	19,943	205,680	187,630	1,200	1,200			4,000	4,673	433,780	2,944,254
Oklahoma			(1)	(1)							(1)	(1)	(1)	(1)
Oregon							(1)	(1)					190,990	224,029
Pennsylvania	146,270	129,860	4,150	11,050			664,060	808,396	242,960	268,826	6,430	18,603	1,486,210	2,935,385
South Dakota			(1)	(1)	3,690	3,537	79,220	111,806			(1)	(1)	91,550	218,908
Tennessee	27,310	65,486	2,070	7,007			(1)	(1)					6,980	97,805
Virginia					(1)	(1)	60,750	56,920	76,500	45,919			143,310	195,697
Washington	1,650	1,515	40	70	450	912	197,390	177,530	1,710	922	8,990	4,495	223,020	290,794
West Virginia			(1)	(1)	300	300	9,580	10,771			(1)	(1)	53,250	61,867
Wisconsin	3,650	1,342	7,250	11,195	(1)	(1)	14,760	16,481			(1)	(1)	171,860	296,047
Wyoming							(1)	(1)					(1)	(1)
Undistributed	14,640	11,389	2,500	8,459	261,840	363,549	48,240	59,500	123,900	68,818	39,210	128,236	203,760	271,190
	774,920	615,439	28,420	61,586	526,560	642,823	2,143,610	2,333,979	497,020	436,929	64,680	164,207	4,594,310	10,285,391

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[1] Included under "Undistributed."

BLUESTONE

The figures for bluestone are included in those for sandstone, but on account of the local importance of this stone they are also given separately. Except for a few of the large quarries, the Bureau of Mines uses the figures of sales reported by dealers rather than those of the quarrymen as more nearly representative of this industry.

Bluestone sold in New York and Pennsylvania, 1929 and 1930

State	Building stone		Curbing		Flagging		Other		Total	
	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value	Short tons	Value	Short tons (approximate)	Value
1929										
New York	84, 170	$214, 386	241, 260	$259, 118	116, 390	$89, 283	9, 220	$9, 058	46, 480	$571, 845
Pennsylvania	7, 950	19, 975	72, 940	66, 628	147, 310	124, 142	240	1, 345	19, 520	212, 090
	92, 120	234, 361	314, 200	325, 746	263, 700	213, 425	9, 460	10, 403	66, 000	783, 935
1930										
New York	109, 260	240, 378	180, 130	221, 044	107, 000	80, 382	10, 600	17, 605	44, 030	559, 409
Pennsylvania	15, 410	31, 466	65, 350	60, 953	134, 090	115, 480	160	731	18, 310	208, 630
	124, 670	271, 844	245, 480	281, 997	241, 090	195, 862	10, 760	18, 336	62, 340	768, 039

MISCELLANEOUS STONE

The material included under "miscellaneous" stone is used mainly for concrete, road metal, and railroad ballast. Because of the nature and irregularity of production of materials in this classification the output is apt to vary greatly. In 1930, a total of 8,603,670 short tons, valued at $8,278,626, was reported, an increase of 3 per cent in both quantity and value over 1929. This is the only class of stone that showed an increase in output in 1930.

The State contributing the largest amount of miscellaneous stone is California. The output of this State includes rhyolite tuff (used as a building stone), andesite, rhyolite, trachyte, and other light-colored volcanic rocks, decomposed granite, hornblende-mica schist, and stone crushed from bowlders taken from river beds. The crushed bowlders are mostly from Los Angeles County, where part of the material taken out is sand, part screened gravel, and the rest chiefly bowlders which are crushed. The sand and screened gravel obtained are included in the report of this series on Sand and Gravel. Among the varieties of stone reported are argillite quarried in Arkansas, New Jersey, and Pennsylvania; phonolite from mine dumps in Colorado; cherty limestone or flint rock in Florida; rhyolite in Missouri; slate, conglomerate, and light-colored volcanic rocks in Massachusetts; and mica schist for building and refractory stone in Pennsylvania. There are also included from the other States volcanic cinders, coral rock, rhyolite, andesite, decomposed granite, mica crystal grit, mica schist, serpentine, graywacke, "gyp" rock, caliche, field stone, and some stone of unknown kinds reported simply as "crushed rock" by local contractors or operators of portable crushers at temporary quarry sites.

Miscellaneous varieties of stone [1] sold or used by producers in the United States, 1929 and 1930, by uses

Use	1929		1930	
	Quantity	Value	Quantity	Value
Building stone.....cubic feet..	2, 556, 900	$293, 010	933, 400	$230, 367
Approximate equivalent in short tons.....	200, 380	------	77, 980	------
Riprap and rubble.....short tons..	277, 660	114, 892	117, 260	119, 844
Crushed stone.....do....	7, 830, 780	7, 363, 683	8, 043, 970	7, 594, 704
Refractory stone (mica schist).....do....	37, 400	145, 246	25, 780	98, 289
Other uses.....do....	34, 030	129, 260	338, 680	235, 422
Total (quantities approximate, in short tons).....	8, 380, 250	8, 046, 091	8, 603, 670	8, 278, 626

[1] Includes mica schist, conglomerate, argillite, various light-colored volcanic rocks, serpentine not used as marble, and such other stone as can not be properly classed in any of the main groups.

Miscellaneous varieties of stone sold or used by producers in the United States, 1929 and 1930, by States

[Quantities approximate]

State	1929		1930	
	Short tons	Value	Short tons	Value
Arizona	329, 590	$298, 012	294, 160	$310, 355
Arkansas	318, 000	410, 480	589, 840	594, 237
California	5, 880, 910	5, 146, 513	5, 412, 410	4, 808, 004
Colorado	322, 040	116, 977	(1)	(1)
Connecticut	------	------	5, 000	8, 000
Florida	9, 010	18, 979	(1)	(1)
Idaho	87, 770	37, 958	107, 240	77, 438
Indiana	------	------	(1)	(1)
Iowa	------	------	(1)	(1)
Maine	41, 810	83, 889	11, 950	29, 644
Maryland	20, 680	39, 575	99, 570	159, 664
Massachusetts	376, 370	602, 526	414, 150	630, 296
Michigan	------	------	(1)	(1)
Missouri	42, 360	71, 461	(1)	(1)
Montana	(1)	(1)	(1)	(1)
New Hampshire	(1)	(1)	23, 250	56, 786
New Jersey	------	------	(1)	(1)
New Mexico	20, 930	21, 193	45, 000	45, 000
New York	(1)	(1)	------	------
North Carolina	(1)	(1)	------	------
Ohio	49, 760	49, 211	91, 490	100, 193
Oklahoma	------	------	5, 140	4, 109
Oregon	------	------	3, 230	3, 232
Pennsylvania	218, 750	422, 183	147, 990	269, 003
Rhode Island	98, 560	165, 761	129, 110	225, 195
South Dakota	4, 430	5, 761	32, 360	8, 671
Texas	388, 960	371, 549	753, 540	627, 656
Utah	2, 660	11, 595	(1)	(1)
Vermont	(1)	(1)	------	------
Virginia	(1)	(1)	(1)	(1)
Washington	------	------	57, 230	21, 938
West Virginia	------	------	(1)	(1)
Wisconsin	(1)	(1)	------	------
Undistributed	167, 660	172, 468	381, 010	299, 205
	8, 380, 250	8, 046, 091	8, 603, 670	8, 278, 626

[1] Included under "Undistributed."

Miscellaneous varieties of stone sold or used by producers in the United States in 1930, by States and uses

State	Number of active plants	Building		Riprap and rubble		Crushed stone				Other uses		Total	
						Concrete and road metal		Railroad ballast					
		Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons (approximate)	Value
Arizona	6	1, 120	$8, 000	3, 330	$3, 695	289, 710	$298, 660					294, 160	$310, 355
Arkansas	5			(1)	(1)	391, 250	422, 645	(1)	(1)			589, 840	594, 237
California	94	(1)	(1)	(1)	(1)	4, 576, 410	4, 170, 711	423, 440	$275, 371	320, 780	$168, 988	5, 412, 410	4, 808, 004
Colorado	2					(1)	(1)					(1)	(1)
Connecticut	1					5, 000	8, 000					5, 000	8, 000
Florida	2			(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)
Idaho	3			(1)	(1)	(1)	(1)					107, 240	77, 438
Indiana	1							(1)	(1)			(1)	(1)
Iowa	1							(1)	(1)			(1)	(1)
Maine	5	670	1, 566			11, 280	28, 078					11, 950	29, 644
Maryland	5	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	3, 760	11, 731	99, 570	159, 664
Massachusetts	9			2, 500	5, 000	411, 650	625, 296					414, 150	630, 296
Michigan	1					(1)	(1)			(1)	(1)	(1)	(1)
Missouri	2					(1)	(1)	(1)	(1)			(1)	(1)
Montana	1					(1)	(1)					(1)	(1)
New Hampshire	2					20, 520	34, 602			2, 730	22, 184	23, 250	56, 786
New Jersey	2	(1)	(1)			(1)	(1)					(1)	(1)
New Mexico	1					45, 000	45, 000					45, 000	45, 000
Ohio	4					(1)	(1)			(1)	(1)	91, 490	100, 193
Oklahoma	1			5, 140	4, 109							5, 140	4, 109
Oregon	1					3, 230	3, 232					3, 230	3, 232
Pennsylvania	15	2, 500	6, 235			117, 470	153, 515	360	578	27, 660	108, 675	147, 990	269, 003
Rhode Island	6					129, 110	225, 195					129, 110	225, 195
South Dakota	4					(1)	(1)	(1)	(1)	(1)	(1)	32, 360	8, 671
Texas	11			630	625	585, 540	497, 083	167, 370	129, 948			753, 540	627, 656
Utah	1									(1)	(1)	(1)	(1)
Virginia	1	(1)	(1)							(1)	(1)	(1)	(1)
Washington	7					57, 230	21, 938					57, 230	21, 938
West Virginia	1					(1)	(1)					(1)	(1)
Undistributed		73, 690	214, 566	105, 660	106, 415	575, 850	495, 065	233, 550	159, 787	9, 530	22, 133	381, 010	299, 205
	195	77, 980	230, 367	117, 260	119, 844	7, 219, 250	7, 029, 020	824, 720	565, 684	364, 460	333, 711	8, 603, 670	8, 278, 626

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[1] Included under "Undistributed."

CRUSHED STONE (CONCRETE AND ROAD METAL AND RAILROAD BALLAST)

The crushed stone sold or used by producers for concrete and road metal and for railroad ballast in the United States in 1930 amounted to 87,110,890 short tons, valued at $87,554,354. These figures represent a decrease of 6 per cent in quantity and 7 per cent in value from 1929. Crushed stone for concrete and road metal (74,293,090 tons, valued at $77,347,379) decreased 2 per cent in quantity and 4 per cent in value; that for railroad ballast (12,817,800 tons, valued at $10,206,975) decreased 23 per cent in quantity and 26 per cent in value. The total average value per ton was $1.01 in 1930, 1 cent less than in 1929. The average value of crushed stone for concrete and road metal ($1.04) was 2 cents less and that for railroad ballast ($0.80) was 3 cents less than in 1929. The figures for crushed stone include reports given by various railroads relative to the noncommercial material used by them, such information as was obtainable from highway departments of the different States on the amount of noncommercial crushed stone used for road construction, and information supplied by a large number of cities, towns, and counties that crush stone for road and repair work. This class of information is difficult to obtain on account of the irregularity of operation and the incomplete records kept by the various municipalities.

Crushed stone sold or used by producers in the United States, 1929 and 1930, by kinds and uses

Kind	Concrete and road metal		Railroad ballast		Total		
	Short tons	Value	Short tons	Value	Short tons	Value	
						Total	Average
1929							
Granite	4, 565, 450	$5, 935, 978	1, 358, 200	$1, 289, 669	5, 923, 650	$7, 225, 647	$1. 22
Basalt and related rocks (trap rock)	12, 507, 020	15, 610, 729	1, 822, 860	1, 954, 590	14, 329, 880	17, 565, 319	1. 23
Limestone	50, 090, 350	50, 057, 122	11, 374, 850	8, 877, 328	61, 465, 200	58, 934, 450	. 96
Sandstone	1, 949, 430	2, 202, 318	1, 222, 320	1, 096, 461	3, 171, 750	3, 298, 779	1. 04
Miscellaneous	7, 062, 520	6, 879, 346	768, 260	484, 337	7, 830, 780	7, 363, 683	. 94
	76, 174, 770	80, 685, 493	16, 546, 490	13, 702, 385	92, 721, 260	94, 387, 878	
Average value per ton		1. 06		0. 83		1. 02	
1930							
Granite	4, 478, 720	5, 712, 038	1, 460, 430	1, 277, 296	5, 939, 150	6, 989, 334	1. 18
Basalt and related rocks (trap rock)	12, 238, 210	14, 483, 363	1, 473, 870	1, 561, 728	13, 712, 080	16, 045, 091	1. 17
Limestone	48, 213, 300	47, 788, 979	8, 561, 760	6, 365, 338	56, 775, 060	54, 154, 317	. 95
Sandstone	2, 143, 610	2, 333, 979	497, 020	436, 929	2, 640, 630	2, 770, 908	1. 05
Miscellaneous	7, 219, 250	7, 029, 020	824, 720	565, 684	8, 043, 970	7, 594, 704	. 94
	74, 293, 090	77, 347, 379	12, 817, 800	10, 206, 975	87, 110, 890	87, 554, 354	
Average value per ton		1. 04		0. 80		1. 01	

Crushed stone sold or used by producers in the United States, 1921–1930, by uses

Year	Concrete and road metal		Railroad ballast		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1921	36, 765, 790	$45, 338, 984	6, 437, 050	$6, 378, 494	43, 202, 840	$51, 717, 478
1922	42, 426, 500	47, 582, 758	7, 337, 240	6, 547, 419	49, 763, 740	54, 130, 177
1923	51, 047, 900	58, 356, 094	11, 274, 810	9, 572, 557	62, 322, 710	67, 928, 651
1924	57, 684, 210	65, 128, 692	10, 514, 230	8, 732, 884	68, 198, 440	73, 861, 576
1925	62, 823, 800	69, 986, 729	12, 849, 130	10, 521, 700	75, 672, 930	80, 508, 429
1926	66, 892, 530	75, 049, 930	15, 623, 030	12, 822, 084	82, 515, 560	87, 872, 014
1927	78, 544, 210	84, 177, 237	16, 404, 560	13, 297, 030	94, 948, 770	97, 474, 267
1928	74, 384, 490	81, 041, 349	16, 880, 870	13, 144, 910	91, 265, 360	94, 186, 259
1929	76, 174, 770	80, 685, 493	16, 546, 490	13, 702, 385	92, 721, 260	94, 387, 878
1930	74, 293, 090	77, 347, 379	12, 817, 800	10, 206, 975	87, 110, 890	87, 554, 354

Crushed stone sold or used by producers in the United States in 1930, by States and uses

State	Concrete and road metal		Railroad ballast		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	42, 280	$38, 512	105, 010	$59, 845	147, 290	$98, 357
Arizona	344, 440	353, 365	(1)	(1)	[2] 344, 440	[2] 353, 365
Arkansas	702, 180	867, 239	[2] 109, 560	[2] 78, 728	[2] 811, 740	[2] 945, 967
California	6, 831, 590	6, 197, 526	746, 080	479, 613	7, 577, 670	6, 677, 139
Colorado	123, 570	83, 977	(1)	(1)	[2] 123, 570	[2] 83, 977
Connecticut	[2] 2, 090, 420	[2] 2, 198, 044	239, 960	240, 429	[2] 2, 330, 380	[2] 2, 438, 473
Delaware	(1)	(1)	-----	-----	(1)	(1)
Florida	[2] 1, 538, 520	[2] 1, 020, 270	[2] 252, 310	[2] 240, 591	[2] 1, 790, 830	[2] 1, 260, 861
Georgia	537, 840	486, 327	(1)	(1)	[2] 537, 840	486, 327
Hawaii	275, 010	438, 839	1, 920	3, 209	276, 930	442, 048
Idaho	[2] 318, 460	[2] 310, 517	(1)	(1)	515, 320	455, 183
Illinois	4, 688, 860	3, 382, 402	475, 720	346, 032	5, 164, 580	3, 728, 434
Indiana	2, 715, 640	2, 438, 387	[2] 249, 760	[2] 167, 882	[2] 2, 965, 400	[2] 2, 606, 269
Iowa	1, 160, 390	1, 297, 836	[2] 242, 310	[2] 215, 148	[2] 1, 402, 700	[2] 1, 512, 984
Kansas	[2] 669, 860	[2] 640, 309	428, 560	374, 093	[2] 1, 098, 420	[2] 1, 014, 402
Kentucky	[2] 1, 773, 720	[2] 1, 828, 442	634, 340	465, 689	[2] 2, 408, 060	[2] 2, 294, 131
Louisiana	(1)	(1)	(1)	(1)	(1)	(1)
Maine	40, 310	81, 171	-----	-----	40, 310	81, 171
Maryland	[2] 792, 530	[2] 1, 110, 569	208, 040	294, 818	[2] 1, 000, 570	[2] 1, 405, 387
Massachusetts	2, 347, 450	3, 000, 944	390, 930	396, 219	2, 738, 380	3, 397, 163
Michigan	[2] 1, 349, 380	[2] 1, 041, 541	[2] 202, 310	[2] 80, 316	1, 562, 060	1, 140, 412
Minnesota	391, 490	460, 983	(1)	(1)	[2] 391, 490	[2] 460, 983
Missouri	2, 230, 800	2, 758, 617	40, 390	44, 719	2, 271, 190	2, 803, 336
Montana	[2] 16, 430	[2] 18, 277	-----	-----	[2] 16, 430	[2] 18, 277
Nebraska	36, 810	37, 523	-----	-----	36, 810	37, 523
Nevada	(1)	(1)	-----	-----	(1)	(1)
New Hampshire	59, 720	98, 759	-----	-----	59, 720	98, 759
New Jersey	2, 481, 100	3, 425, 718	81, 410	100, 143	2, 562, 510	3, 525, 861
New Mexico	[2] 45, 000	[2] 45, 000	(1)	(1)	[2] 211, 000	[2] 158, 440
New York	10, 000, 950	13, 205, 588	1, 066, 080	1, 051, 593	11, 067, 030	14, 257, 181
North Carolina	[2] 710, 450	[2] 906, 063	213, 540	219, 724	[2] 923, 990	[2] 1, 125, 787
Ohio	[2] 8, 081, 620	[2] 6, 179, 614	1, 333, 000	876, 752	[2] 9, 414, 620	[2] 7, 056, 366
Oklahoma	1, 225, 550	1, 087, 245	703, 200	405, 593	1, 928, 750	1, 492, 838
Oregon	[2] 1, 459, 740	[2] 1, 413, 427	(1)	(1)	[2] 1, 478, 990	[2] 1, 432, 677
Pennsylvania	7, 676, 780	9, 164, 379	657, 560	730, 716	8, 334, 340	9, 895, 095
Porto Rico	29, 520	59, 386	(1)	(1)	[2] 29, 520	[2] 59, 386
Rhode Island	183, 130	301, 011	2, 410	4, 159	185, 540	305, 170
South Carolina	1, 223, 440	1, 610, 087	110, 690	84, 396	1, 334, 130	1, 694, 483
South Dakota	[2] 105, 800	[2] 145, 231	(1)	(1)	132, 760	152, 672
Tennessee	[2] 1, 097, 190	[2] 1, 086, 699	374, 030	291, 299	[2] 1, 471, 220	[2] 1, 377, 998
Texas	[2] 1, 504, 350	[2] 1, 263, 843	[2] 959, 810	[2] 650, 965	[2] 2, 464, 160	[2] 1, 914, 808
Utah	470	291	180, 190	109, 575	180, 660	109, 866
Vermont	56, 660	77, 448	-----	-----	56, 660	77, 448
Virginia	[2] 1, 692, 880	[2] 1, 737, 478	[2] 921, 450	[2] 753, 537	3, 108, 750	2, 947, 680
Washington	1, 452, 470	1, 310, 947	66, 440	53, 933	1, 518, 910	1, 364, 880
West Virginia	[2] 644, 710	[2] 667, 473	506, 910	375, 990	[2] 1, 151, 620	[2] 1, 043, 463
Wisconsin	[2] 2, 637, 570	[2] 2, 393, 300	350	310	[2] 2, 637, 920	[2] 2, 393, 610
Wyoming	[2] 52, 970	[2] 92, 240	(1)	(1)	60, 600	94, 929
Undistributed	853, 040	984, 535	1, 313, 530	1, 010, 959	1, 245, 080	1, 232, 788
	74, 293, 090	77, 347, 379	12, 817, 800	10, 206, 975	87, 110, 890	87, 554, 354

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(1) Included under "Undistributed."

[2] To avoid disclosing confidential information certain totals are somewhat incomplete, the figures not included being combined under "Undistributed."

SAND AND GRAVEL[1]

By E. R. PHILLIPS[2]

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PRODUCTION

The total output of sand and gravel reported as sold or used by producers in the United States in 1930 amounted to 197,051,726 short tons, valued at $115,176,543, a decrease of 11 per cent in quantity and 13 per cent in value as compared with 1929.

Paving gravel was the only class of sand and gravel materials that increased in output, amounting to 7 per cent more in quantity, but 3 per cent less in value, than in 1929. Glass sand decreased 17 per cent in quantity and 15 per cent in value. The decrease in molding sand, as reported by producers, amounted to 46 per cent in quantity and 45 per cent in value; the 1930 production of molding sand was less than that for any year since 1921. Building sand decreased 18 per cent in quantity and 19 per cent in value, and building gravel decreased 13 per cent in quantity and 10 per cent in value.

The total output of sand in 1930 amounted to 83,658,618 short tons, valued at $49,721,553, a decrease of 16 per cent in quantity and 18 per cent in value as compared with 1929. The total output of gravel amounted to 113,393,108 short tons, valued at $65,454,990, a decrease of 8 per cent in quantity and 9 per cent in value from 1929.

Fourteen States each reported the production of over 5,000,000 tons of sand and gravel. New York and Illinois, with outputs of 20,865,866 and 17,398,693 short tons, respectively, were the largest producers of these materials in 1930. Ohio, California, Michigan, and Pennsylvania produced more than 10,000,000 tons each. New York and Pennsylvania led the States in total value of output in 1930.

The total washed and screened sand and gravel sold or used by producers in 1930 amounted to 146,789,550 short tons, valued at $95,096,252, or 74 per cent of the total sand and gravel produced. Production was reported for approximately 2,700 plants and pits in 1930, as compared with 2,900 in 1929.

In addition to the sand sold or used by producers for the purposes listed in this report, other sand was finely ground or pulverized for use in paint, pottery, fillers, and similar products. In 1930, 241,947 short tons of such finely ground or pulverized sand, valued at $1,566,815, was sold or used by producers in the United States. This subject is discussed in the chapter on Silica in Mineral Resources of the United States.

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[1] Work on manuscript completed October, 1931.

[2] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Sand and gravel sold or used by producers in the United States, 1921–1930

Year	Sand		Gravel (including railroad ballast)		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1921	38, 294, 954	$29, 049, 950	41, 550, 054	$27, 434, 295	79, 845, 008	$56, 484, 245
1922	49, 694, 923	35, 469, 920	45, 172, 123	29, 147, 744	94, 867, 046	64, 617, 664
1923	67, 365, 271	48, 473, 565	72, 566, 882	42, 430, 089	139, 932, 153	90, 903, 654
1924	75, 572, 010	48, 844, 465	80, 658, 053	48, 168, 650	156, 230, 063	97, 013, 115
1925	87, 182, 222	55, 148, 325	84, 819, 251	52, 393, 798	172, 001, 473	107, 542, 123
1926	92, 114, 279	55, 675, 988	90, 986, 539	55, 662, 713	183, 100, 818	111, 338, 701
1927	93, 588, 339	54, 291, 398	103, 865, 930	61, 238, 388	197, 454, 269	115, 529, 786
1928	97, 737, 717	56, 132, 406	111, 381, 151	63, 075, 531	209, 118, 868	119, 207, 937
1929	99, 253, 054	60, 801, 357	123, 318, 851	72, 034, 622	222, 571, 905	132, 835, 979
1930	83, 658, 618	49, 721, 553	113, 393, 108	65, 454, 990	197, 051, 726	115, 176, 543

Sand and gravel sold or used by producers in the United States, 1929 and 1930, by uses

Use	1929		1930	
	Short tons	Value	Short tons	Value
Sand:				
Glass	2, 219, 677	$3, 788, 471	1, 849, 101	$3, 210, 973
Molding	6, 195, 343	6, 410, 343	3, 336, 855	3, 547, 154
Building	41, 161, 013	23, 309, 238	33, 599, 524	18, 850, 936
Paving	40, 801, 991	21, 131, 731	36, 367, 468	18, 674, 649
Grinding and polishing	1, 636, 464	2, 303, 652	1, 115, 915	1, 613, 022
Fire or furnace	440, 679	483, 551	258, 241	333, 727
Engine	2, 318, 931	1, 487, 906	1, 773, 204	1, 219, 070
Filter	100, 081	199, 838	80, 326	167, 947
Other [1]	4, 378, 875	1, 686, 627	5, 277, 984	2, 104, 075
	99, 253, 054	60, 801, 357	83, 658, 618	49, 721, 553
Gravel:				
Building	32, 448, 800	23, 813, 885	28, 271, 902	21, 346, 251
Paving	60, 029, 164	38, 695, 207	64, 408, 274	37, 349, 936
Railroad ballast [2]	30, 840, 887	9, 525, 530	20, 712, 932	6, 758, 803
	123, 318, 851	72, 034, 622	113, 393, 108	65, 454, 990
Grand total	222, 571, 905	132, 835, 979	197, 051, 726	115, 176, 543

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[1] Includes some sand used for railroad ballast, fills, etc.

[2] Includes some gravel used by the railroads for fills and other purposes. The quantity of gravel reported as used exclusively for railroad ballast was as follows: 1929, 27,332,529 tons, valued at $8,804,082; 1930, 16,227,543 tons, valued at $5,554,684.

Sand and gravel sold or used by producers in the United States in 1929, by States and uses

State	Glass sand		Molding sand		Building sand		Paving sand		Grinding and polishing sand		Fire or furnace sand		Engine sand	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama			44,482	$37,662	516,646	$154,451	539,585	$228,240					(1)	(1)
Arizona					127,401	111,395	43,044	42,858					8,750	$2,888
Arkansas	(1)	(1)	(1)	(1)	266,554	148,568	363,903	210,272	(1)	(1)			20,971	8,842
California	7,500	$27,000	56,030	118,376	3,701,485	1,554,495	3,123,264	1,267,770	25,070	$58,646	19,073	$25,846	111,710	47,819
Colorado			11,645	9,265	215,785	113,674	20,640	11,236					26,665	15,031
Connecticut			(1)	(1)	332,972	208,434	246,562	192,126	2,373	9,106				
Delaware			6,149	4,532	17,017	11,395	23,000	12,000	134	689			10,000	4,000
District of Columbia					(1)	(1)	(1)	(1)					(1)	(1)
Florida	(1)	(1)			271,152	112,883	287,712	136,266					(1)	(1)
Georgia	10,470	11,517	11,840	2,920	246,984	95,243	269,165	83,542	(1)	(1)			18,293	6,864
Idaho					(1)	(1)	19,471	7,640					(1)	(1)
Illinois	552,539	502,434	1,135,820	804,371	4,011,481	1,573,236	2,020,278	822,156	449,475	901,145	65,795	54,768	142,864	75,307
Indiana	(1)	(1)	407,098	230,580	1,431,223	619,625	1,829,114	856,349	(1)	(1)	(1)	(1)	129,569	47,710
Iowa			48,558	32,911	442,491	224,833	1,294,148	538,416	(1)	(1)			44,338	22,146
Kansas			15,016	10,371	1,050,317	608,983	991,381	538,691	5,546	2,902			63,070	35,113
Kentucky			22,232	37,051	465,472	276,921	283,502	159,712			(1)	(1)	14,839	11,404
Louisiana					253,427	87,814	525,532	217,049	(1)	(1)			(1)	(1)
Maine					67,609	40,990	(1)	(1)					(1)	(1)
Maryland	(1)	(1)	(1)	(1)	409,473	209,228	1,311,231	858,682	(1)	(1)			(1)	(1)
Massachusetts	210	1,080	40,732	42,145	1,353,782	938,387	356,129	215,499	(1)	(1)	(1)	(1)	79,340	59,233
Michigan	(1)	(1)	1,150,807	305,447	1,941,452	800,116	3,152,125	1,239,397	(1)	(1)	(1)	(1)	17,998	3,938
Minnesota			27,919	23,259	968,369	346,239	554,310	219,604	(1)	(1)			64,323	20,525
Mississippi					212,494	153,435	242,311	118,642	(1)	(1)			(1)	(1)
Missouri	123,141	178,531	82,970	59,095	1,244,725	855,727	1,277,630	880,184	(1)	(1)			32,837	20,832
Montana			68	50	49,203	37,108	22,648	15,382					161	86
Nebraska			(1)	(1)	628,548	251,189	92,176	47,578					15,950	5,290
Nevada	(1)	(1)	(1)	(1)			(1)	(1)						
New Hampshire					(1)	(1)	439,297	144,162						
New Jersey	166,822	257,757	731,246	903,513	1,888,164	1,111,738	2,044,357	1,105,122	67,319	163,143	81,546	109,527	76,348	32,728
New Mexico					60,881	53,886	(1)	(1)	270	400			(1)	(1)
New York	(1)	(1)	591,866	984,077	6,590,182	4,233,415	6,438,889	3,882,774	2,513	2,963	(1)	(1)	186,286	121,691
North Carolina			(1)	(1)	136,930	60,512	199,794	46,463					68,968	39,116
North Dakota					52,057	26,854	(1)	(1)						
Ohio	74,666	184,424	977,441	1,357,075	2,636,704	1,733,778	2,444,878	1,405,580	(1)	(1)	60,069	107,992	75,043	45,721
Oklahoma	22,872	40,026			752,080	388,995	644,940	306,434	(1)	(1)			20,849	13,804
Oregon					274,799	242,161	292,689	217,525					(1)	(1)
Pennsylvania	506,812	1,011,063	432,632	647,879	3,452,533	3,300,615	2,426,304	2,110,870	570,717	664,910	101,373	133,123	328,012	355,027

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[1] Included under "Undistributed."

Sand and gravel sold or used by producers in the United States in 1929, by States and uses—Continued

State	Glass sand		Molding sand		Building sand		Paving sand		Grinding and polishing sand		Fire or furnace sand		Engine sand	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Rhode Island	--------	--------	(1)	(1)	27, 434	$8, 187	71, 784	$24, 503	(1)	(1)	--------	--------	--------	--------
South Carolina	--------	--------	--------	--------	116, 233	30, 237	304, 209	98, 169	(1)	(1)	--------	--------	(1)	(1)
South Dakota	--------	--------	--------	--------	58, 529	32, 380	91, 770	22, 199	--------	--------	--------	--------	1, 407	$705
Tennessee	--------	--------	10, 464	$8, 958	542, 181	336, 662	580, 924	353, 940	48, 961	$37, 182	(1)	(1)	38, 834	30, 084
Texas	1, 500	$487	3, 320	10, 835	1, 114, 952	637, 394	1, 485, 330	792, 514	235	625	--------	--------	78, 344	35, 443
Utah	--------	--------	--------	--------	111, 732	56, 661	55, 672	30, 834	--------	--------	--------	--------	--------	--------
Vermont	--------	--------	2, 284	457	(1)	(1)	26, 821	24, 245	(1)	(1)	--------	--------	(1)	(1)
Virginia	70, 101	145, 990	17, 816	29, 609	172, 650	104, 808	477, 893	184, 932	13, 349	14, 582	(1)	(1)	131, 697	63, 395
Washington	--------	--------	1, 540	5, 034	668, 057	366, 497	304, 864	139, 153	--------	--------	--------	--------	67, 672	34, 134
West Virginia	498, 729	1, 049, 281	(1)	(1)	345, 490	322, 554	379, 627	344, 645	(1)	(1)	--------	--------	251, 156	210, 174
Wisconsin	--------	--------	128, 597	82, 508	1, 471, 019	469, 327	2, 155, 460	810, 911	33, 347	73, 132	(1)	(1)	57, 912	14, 306
Wyoming	--------	--------	--------	--------	(1)	(1)	(1)	(1)	--------	--------	--------	--------	(1)	(1)
Undistributed [2]	184, 315	378, 881	236, 771	662, 363	462, 344	258, 208	1, 047, 628	167, 465	417, 155	374, 227	112, 823	$52, 295	134, 725	104, 550
	2, 219, 677	3, 788, 471	6, 195, 343	6, 410, 343	41, 161, 013	23, 309, 238	40, 801, 991	21, 131, 731	1, 636, 464	2, 303, 652	440, 679	483, 551	2, 318, 931	1, 487, 906
Average value	--------	1. 71	--------	1. 03	--------	0. 57	--------	0. 52	--------	1. 41	--------	1. 10	--------	0. 64

State	Filter sand		Other sands		Building gravel		Paving gravel		Railroad ballast gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	400	$1, 600	(1)	(1)	501, 882	$304, 569	699, 106	$492, 786	32, 140	$4, 660	2, 371, 545	$1, 229, 424
Arizona	--------	--------	556	$133	105, 211	103, 810	(1)	(1)	(1)	(1)	395, 386	329, 116
Arkansas	--------	--------	(1)	(1)	187, 216	176, 976	1, 293, 636	741, 859	1, 796, 688	478, 150	3, 992, 336	1, 851, 755
California	5, 131	11, 742	187, 066	78, 322	3, 616, 853	2, 313, 223	3, 879, 523	2, 607, 987	955, 840	260, 037	15, 688, 545	8, 371, 263
Colorado	--------	--------	4, 598	2, 008	259, 512	194, 153	171, 859	105, 028	272, 162	42, 192	982, 866	492, 587
Connecticut	540	337	84, 769	38, 709	92, 275	93, 388	83, 873	17, 222	(1)	(1)	850, 390	566, 410
Delaware	(1)	(1)	7, 936	13, 215	592	888	(1)	(1)	--------	--------	78, 055	59, 266
District of Columbia	--------	--------	--------	--------	(1)	(1)	(1)	(1)	--------	--------	(1)	(1)
Florida	--------	--------	(1)	(1)	117, 050	98, 432	73, 483	55, 269	20, 751	16, 808	788, 298	422, 409
Georgia	315	1, 733	10, 762	4, 739	7, 392	8, 485	(1)	(1)	(1)	(1)	604, 611	235, 299
Idaho	--------	--------	(1)	(1)	46, 021	28, 932	140, 397	125, 403	396, 925	57, 272	661, 993	243, 173
Illinois	1, 053	4, 212	1, 048, 439	534, 136	3, 401, 945	1, 589, 935	3, 363, 578	1, 564, 304	2, 062, 936	645, 234	18, 256, 203	9, 071, 238
Indiana	(1)	(1)	465, 111	112, 749	1, 144, 734	749, 303	2, 907, 477	1, 820, 461	2, 457, 721	1, 028, 953	10, 901, 798	5, 528, 832
Iowa	(1)	(1)	39, 068	8, 691	317, 719	254, 666	1, 600, 895	973, 893	237, 716	115, 146	4, 043, 609	2, 211, 752

Kansas	1,472	1,976	78,486	36,342	108,965	56,783	914,149	556,002	161,381	32,736	3,389,783	1,879,899
Kentucky	------	------	(1)	(1)	481,291	294,349	898,947	742,434	(1)	(1)	2,350,430	1,581,501
Louisiana	------	------	45,086	18,812	578,054	502,802	1,114,748	901,748	605,943	333,178	3,138,673	2,069,024
Maine	------	------	------	------	120,491	121,801	1,534,666	135,994	412,666	93,756	2,861,271	447,140
Maryland	------	------	------	------	299,077	302,922	1,095,454	1,346,605	(1)	(1)	3,193,486	2,853,617
Massachusetts	2,328	4,556	4,822	6,144	858,139	971,277	1,736,237	1,104,276	664,102	144,322	5,114,188	3,503,576
Michigan	------	------	548,312	127,883	2,533,588	1,425,565	5,139,278	2,969,864	2,177,970	860,525	16,844,099	7,928,744
Minnesota	(1)	(1)	(1)	(1)	629,310	583,839	1,223,437	919,314	1,482,348	275,407	4,990,256	2,412,776
Mississippi	------	------	------	------	129,384	91,681	1,636,994	733,642	535,729	178,130	2,766,036	1,277,746
Missouri	------	------	(1)	(1)	829,630	632,667	1,578,684	1,275,175	421,012	213,635	5,775,729	4,291,164
Montana	------	------	113,065	28,363	332,436	150,751	62,440	37,710	1,866,401	398,377	2,446,422	667,827
Nebraska	------	------	(1)	(1)	1,087,975	643,746	1,211,342	822,898	320,204	81,132	3,370,513	1,857,065
Nevada	------	------	------	------	(1)	(1)	666,691	425,663	711,199	68,972	1,403,255	605,079
New Hampshire	------	------	------	------	38,254	31,707	1,119,515	968,379	(1)	(1)	1,976,781	1,223,371
New Jersey	30,039	80,725	12,723	11,136	752,762	930,241	856,166	864,378	14,006	15,277	6,721,498	5,585,285
New Mexico	------	------	------	------	59,321	62,820	------	------	203,166	49,269	337,768	177,368
New York	(1)	(1)	164,457	77,652	3,362,441	2,900,439	3,291,876	2,595,089	423,570	111,927	21,061,094	14,919,658
North Carolina	------	------	91,863	58,464	(1)	(1)	179,878	170,530	74,459	41,981	1,004,858	1,020,533
North Dakota	------	------	------	------	72,312	67,879	66,382	5,808	(1)	(1)	493,411	133,621
Ohio	(1)	(1)	258,044	54,494	1,807,360	1,220,046	3,085,107	1,786,631	2,788,582	1,109,650	14,250,141	9,182,862
Oklahoma	1,300	3,900	(1)	(1)	222,559	157,746	927,089	545,297	197,579	142,483	2,904,897	1,612,755
Oregon	------	------	(1)	(1)	486,100	347,344	940,884	608,053	250,215	89,692	2,257,338	1,508,787
Pennsylvania	------	------	(1)	(1)	2,966,015	3,107,532	1,848,278	2,292,593	(1)	(1)	12,674,320	13,658,328
Rhode Island	------	------	------	------	49,629	21,785	132,357	54,945	------	------	301,533	154,390
South Carolina	(1)	(1)	(1)	(1)	(1)	(1)	136,059	151,762	264,631	167,087	1,068,005	602,432
South Dakota	------	------	6,739	2,308	26,218	23,922	2,112,700	398,387	431,908	98,303	2,729,271	578,204
Tennessee	------	------	(1)	(1)	407,383	261,723	1,361,957	1,017,802	(1)	(1)	3,089,500	2,086,535
Texas	7,950	16,279	353,915	139,957	1,327,648	1,079,546	2,971,979	2,126,303	2,064,122	926,560	9,409,295	5,765,943
Utah	------	------	(1)	(1)	105,154	59,013	857,052	478,140	(1)	(1)	1,588,305	722,971
Vermont	------	------	10,676	4,859	4,320	4,596	13,221	6,459	(1)	(1)	170,301	58,879
Virginia	------	------	98,958	47,877	155,161	145,336	445,989	339,252	(1)	(1)	1,728,590	1,165,358
Washington	------	------	55,054	13,906	800,257	387,805	1,795,377	942,645	1,698,872	248,845	5,391,693	2,138,019
West Virginia	------	------	(1)	(1)	410,852	351,934	519,403	431,588	213,777	132,771	2,667,940	2,893,542
Wisconsin	(1)	(1)	(1)	(1)	1,123,842	481,522	3,880,484	2,110,533	1,806,477	501,140	10,727,632	4,574,182
Wyoming	------	------	------	------	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Undistributed [2]	49,553	72,778	688,370	265,728	484,470	476,006	460,517	325,096	2,817,689	561,923	2,757,958	1,085,274
	100,081	199,838	[3] 4,378,875	[3] 1,686,627	32,448,800	23,813,885	60,029,164	38,695,207	[4] 30,840,887	[4] 9,525,530	222,571,905	132,835,979
Average value	------	2.00	------	0.39	------	0.73	------	0.64	------	0.31	------	0.60

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[1] Included under "Undistributed."

[2] Includes items entered as "(1)."

[3] Includes 2,505,408 tons of sand, valued at $703,891, used for railroad ballast; some sand used by the railroads and others for fills, bank widening, and stock-car bedding; and some miscellaneous material.

[4] Includes some gravel used by the railroads for fills and other purposes. The quantity of gravel reported as used exclusively for railroad ballast was 27,332,529 tons, valued at $8,804,082.

Sand and gravel sold or used by producers in the United States in 1930, by States and uses

State	Glass sand		Molding sand		Building sand		Paving sand		Grinding and polishing sand		Fire or furnace sand		Engine sand	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama			9,700	$9,700	325,184	$98,674	320,627	$178,136					7,901	$1,975
Arizona					82,988	73,814	41,172	35,312					(1)	(1)
Arkansas	(1)	(1)	(1)	(1)	203,656	146,715	413,326	249,641	(1)	(1)			16,492	8,932
California	(1)	(1)	41,107	88,217	2,416,502	1,135,167	2,435,017	1,053,398	35,768	$52,302	13,487	$22,755	(1)	(1)
Colorado			8,148	11,188	155,857	82,299	240,244	58,666			(1)	(1)	(1)	(1)
Connecticut			482	930	352,459	196,282	174,240	136,469	2,635	6,417				
Delaware			4,825	4,621	11,833	10,497	33,620	15,830	(1)	(1)			(1)	(1)
District of Columbia					(1)	(1)	(1)	(1)					(1)	(1)
Florida	(1)	(1)	6,000	3,900	190,966	96,472	163,753	72,166	(1)	(1)	1,400	910	7,387	4,455
Georgia	(1)	(1)	33,580	5,734	195,708	57,259	250,965	86,042	(1)	(1)			8,277	3,182
Idaho					5,816	5,780	1,875	1,237					(1)	(1)
Illinois	489,824	$490,533	589,238	455,416	2,685,313	1,258,618	2,905,191	1,073,470	322,976	657,689	41,416	29,392	112,184	63,723
Indiana	4,400	1,540	187,466	128,343	863,015	327,668	1,777,451	695,194			50,082	24,656	33,903	13,188
Iowa			28,343	27,030	583,949	292,721	1,397,207	562,809	2,788	4,137	(1)	(1)	31,184	15,396
Kansas			1,394	931	953,552	483,306	892,540	459,651	(1)	(1)			72,976	41,003
Kentucky			10,118	17,069	281,916	225,631	443,503	317,347			(1)	(1)	19,541	15,711
Louisiana					336,141	116,499	509,305	219,309	(1)	(1)			(1)	(1)
Maine			(1)	(1)	61,481	40,615	24,429	11,260	(1)	(1)			(1)	(1)
Maryland	(1)	(1)	(1)	(1)	165,776	120,494	1,249,854	875,000			3,050	1,555	(1)	(1)
Massachusetts	212	1,103	28,753	28,040	1,202,341	826,557	414,743	131,238	4,156	6,400	(1)	(1)	87,646	61,648
Michigan	(1)	(1)	521,452	158,561	1,219,592	452,431	1,890,094	726,899	76,303	26,688	(1)	(1)	12,886	3,413
Minnesota	5,000	5,500	28,406	30,520	768,902	270,756	848,278	265,653	2,259	5,545			24,454	6,689
Mississippi					(1)	(1)	113,530	56,497					(1)	(1)
Missouri	131,233	207,748	58,187	41,656	1,002,059	654,207	1,581,213	1,158,159	(1)	(1)			46,427	27,478
Montana					55,268	45,568								
Nebraska					513,009	194,335	51,550	29,093					(1)	(1)
Nevada	(1)	(1)	(1)	(1)										
New Hampshire					(1)	(1)	449,927	157,849						
New Jersey	119,410	209,607	477,738	626,522	1,888,009	1,181,358	1,606,815	875,188	47,716	113,556	39,072	54,584	45,035	15,096
New Mexico					(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)
New York	(1)	(1)	346,459	575,978	6,487,554	3,409,421	5,534,898	2,821,399	(1)	(1)			142,847	99,809
North Carolina			(1)	(1)	113,232	25,534	221,668	42,250					48,072	25,706
North Dakota					13,291	4,994	32,060	13,032						
Ohio	64,072	190,182	510,175	713,043	2,116,933	1,338,191	2,249,397	1,246,634	39,916	175,182	45,253	120,823	63,494	54,945
Oklahoma	19,216	30,746			700,668	353,099	554,491	240,891	(1)	(1)	244	98	22,728	13,970
Oregon					280,981	240,752	283,925	170,114					18,712	5,818
Pennsylvania	326,760	653,607	309,533	449,780	3,124,854	2,831,032	2,278,813	2,118,769	343,350	348,866	56,180	74,428	299,277	345,686
Rhode Island			(1)	(1)	8,520	4,500	198,895	54,426						
South Carolina			(1)	(1)	107,866	41,578	203,886	76,464	(1)	(1)				
South Dakota					27,195	16,998	84,200	25,717					1,055	527

Tennessee			6, 594	6, 270	316, 165	191, 760	383, 276	329, 639	47, 408	44, 625	(1)	(1)	13, 192	10, 488
Texas	13, 179	13, 662	3, 114	9, 846	1, 255, 254	698, 249	1, 161, 730	676, 223	169	118			42, 978	12, 948
Utah					80, 286	40, 610	73, 784	33, 283					12, 195	4, 980
Vermont			1, 050	525	(1)	(1)	9, 015	7, 369	(1)	(1)			(1)	(1)
Virginia	59, 549	117, 764	24, 404	24, 547	131, 627	84, 838	385, 310	160, 791	(1)	(1)			92, 000	43, 373
Washington			1, 075	3, 751	716, 631	354, 664	355, 800	142, 730					82, 061	25, 478
West Virginia	480, 681	967, 434	(1)	(1)	234, 716	219, 465	498, 512	424, 201	(1)	(1)	74	96	179, 283	167, 920
Wisconsin			62, 927	52, 870	845, 995	319, 818	1, 327, 885	399, 088	27, 888	43, 010			69, 605	12, 630
Wyoming					(1)	(1)								
Undistributed [2]	135, 565	321, 547	36, 587	72, 166	516, 464	281, 709	299, 454	190, 116	162, 583	128, 487	7, 983	4, 430	159, 412	112, 903
	1, 849, 101	3, 210, 973	3, 336, 855	3, 547, 154	33,599,524	18, 850, 936	36, 367, 468	18, 674, 649	1, 115, 915	1, 613, 022	258, 241	333, 727	1, 773, 204	1, 219, 070
Average value		1. 74		1. 06		0. 56		0. 51		1. 45		1. 29		0. 69

State	Filter sand		Other sands		Building gravel		Paving gravel		Railroad ballast gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama					323, 591	$189, 089	483, 928	$411, 913	44, 229	$11, 601	1, 515, 160	$901, 088
Arizona			(1)	(1)	97, 237	96, 800	141, 739	137, 876	(1)	(1)	402, 796	361, 326
Arkansas			(1)	(1)	247, 006	212, 153	1, 194, 199	658, 879	566, 227	195, 004	2, 720, 756	1, 555, 408
California	(1)	(1)	541, 894	$299, 912	2, 580, 179	1, 853, 641	3, 039, 659	2, 167, 969	1, 480, 662	621, 782	12, 604, 051	7, 354, 506
Colorado					147, 285	120, 750	343, 493	148, 753	(1)	(1)	929, 888	442, 303
Connecticut			23, 991	11, 230	94, 883	80, 663	16, 161	12, 818	5, 650	2, 164	670, 501	446, 973
Delaware	5, 100	$9, 650	(1)	(1)	(1)	(1)					74, 897	55, 193
District of Columbia					(1)	(1)	(1)	(1)			(1)	(1)
Florida	(1)	(1)	19, 000	3, 800	56, 960	48, 441	48, 002	36, 728			496, 198	269, 161
Georgia	530	2, 385	30, 474	20, 092	4, 744	6, 749	43, 564	30, 100	(1)	(1)	586, 929	228, 396
Idaho			42, 550	426	26, 108	10, 781	158, 174	126, 740	(1)	(1)	353, 839	169, 755
Illinois	3, 348	12, 055	2, 281, 673	947, 109	1, 947, 176	981, 412	4, 873, 777	2, 067, 529	1, 146, 577	345, 079	17, 398, 693	8, 382, 025
Indiana	840	300	170, 164	30, 238	887, 799	561, 851	3, 556, 097	2, 030, 532	2, 307, 540	854, 261	9, 838, 757	4, 667, 771
Iowa	3, 172	1, 939	(1)	(1)	485, 792	496, 261	1, 749, 235	1, 113, 549	176, 608	64, 885	4, 521, 971	2, 599, 107
Kansas	(1)	(1)	46, 429	12, 596	101, 035	42, 044	954, 661	562, 433	173, 709	26, 215	3, 232, 858	1, 649, 476
Kentucky			(1)	(1)	318, 179	275, 467	875, 733	668, 554	59, 850	22, 243	2, 029, 456	1, 553, 812
Louisiana			(1)	(1)	655, 800	526, 531	1, 193, 030	1, 019, 696	548, 011	314, 843	3, 318, 965	2, 225, 211
Maine					30, 116	25, 815	4, 627, 526	572, 353	463, 960	154, 246	5, 215, 342	806, 545
Maryland					174, 228	143, 383	1, 042, 214	1, 134, 186	(1)	(1)	2, 678, 914	2, 330, 324
Massachusetts			(1)	(1)	825, 329	933, 956	2, 012, 823	716, 299	636, 775	76, 935	5, 226, 669	2, 790, 436
Michigan	(1)	(1)	364, 479	53, 681	1, 573, 059	845, 959	4, 812, 224	2, 484, 826	860, 109	275, 820	11, 389, 119	5, 161, 176
Minnesota	1, 257	3, 771	190, 502	42, 193	805, 426	594, 593	1, 065, 502	877, 038	850, 804	172, 035	4, 590, 790	2, 274, 293
Mississippi					324, 662	171, 783	1, 165, 441	610, 777	281, 913	165, 806	2, 001, 272	1, 050, 579
Missouri			(1)	(1)	1, 139, 395	965, 861	1, 648, 695	1, 471, 861	219, 058	127, 598	5, 956, 766	4, 776, 078
Montana			66, 306	10, 717	99, 899	78, 633	121, 646	90, 530	1, 180, 397	246, 107	1, 523, 516	471, 555
Nebraska			(1)	(1)	985, 695	543, 705	1, 736, 420	923, 939	141, 667	35, 223	3, 443, 715	1, 731, 230
Nevada			(1)	(1)					468, 948	88, 531	489, 726	184, 691
New Hampshire					(1)	(1)	365, 401	309, 069	(1)	(1)	939, 767	556, 808

[1] Included under "Undistributed."

[2] Includes items entered as "(1)."

Sand and gravel sold or used by producers in the United States in 1930, by States and uses—Continued

State	Filter sand		Other sands		Building gravel		Paving gravel		Railroad ballast gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
New Jersey	28, 237	$74, 150	64, 208	$77, 846	900, 755	$1, 167, 758	655, 143	$553, 559	97, 341	$60, 642	5, 969, 479	$5, 009, 866
New Mexico					(1)	(1)	197, 461	210, 926	58, 500	27, 129	314, 667	282, 360
New York	7, 600	4, 200	194, 482	60, 800	3, 774, 786	2, 716, 451	4, 230, 579	2, 947, 416	139, 726	63, 207	20, 865, 866	12, 710, 172
North Carolina			(1)	(1)	84, 151	69, 312	225, 015	204, 092	(1)	(1)	800, 222	437, 555
North Dakota			(1)	(1)	23, 565	18, 014	131, 414	50, 303	(1)	(1)	473, 184	127, 505
Ohio	4, 942	10, 091	232, 670	62, 731	1, 629, 676	1, 159, 738	3, 150, 799	2, 069, 049	2, 572, 527	1, 033, 132	12, 679, 854	8, 173, 741
Oklahoma	(1)	(1)	(1)	(1)	268, 166	215, 471	968, 121	584, 645	7, 874	3, 938	2, 553, 070	1, 446, 137
Oregon			15, 709	12, 596	423, 250	275, 198	1, 320, 417	869, 684	481, 525	70, 081	2, 824, 519	1, 644, 243
Pennsylvania			60, 293	56, 357	2, 482, 433	2, 704, 255	1, 702, 653	1, 518, 831	28, 366	6, 214	11, 012, 512	11, 107, 825
Rhode Island					6, 613	5, 750	500, 073	191, 802	(1)	(1)	728, 390	283, 174
South Carolina			(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	744, 378	475, 009
South Dakota			1, 429	715	78, 768	19, 800	2, 092, 951	847, 132	133, 843	20, 925	2, 419, 441	931, 814
Tennessee			(1)	(1)	274, 630	160, 307	969, 823	621, 373	(1)	(1)	2, 182, 958	1, 436, 034
Texas	4, 751	8, 830	167, 377	31, 969	1, 532, 691	1, 287, 417	2, 592, 053	2, 000, 875	2, 030, 633	826, 990	8, 803, 929	5, 567, 127
Utah			17, 520	5, 185	112, 468	57, 402	738, 063	428, 855	167, 533	43, 636	1, 201, 849	613, 951
Vermont			(1)	(1)	38, 373	5, 219	25, 086	17, 565	221, 253	24, 821	313, 060	67, 369
Virginia			(1)	(1)	130, 229	136, 601	429, 896	308, 023	125, 949	72, 244	1, 470, 380	997, 227
Washington			8, 810	4, 385	1, 162, 385	535, 008	2, 272, 079	991, 741	708, 781	123, 255	5, 307, 622	2, 181, 012
West Virginia			68, 005	29, 844	297, 585	253, 492	740, 426	627, 112	175, 910	83, 958	2, 695, 437	2, 813, 284
Wisconsin	5, 029	16, 580	91, 665	32, 455	654, 735	278, 772	3, 354, 345	1, 478, 683	641, 989	167, 807	7, 082, 063	2, 801, 713
Wyoming			(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Undistributed[2]	15, 520	23, 996	578, 354	297, 198	465, 060	473, 965	842, 533	443, 323	1, 508, 488	330, 446	2, 457, 535	1, 074, 199
	80, 326	167, 947	[3] 5, 277, 984	[3] 2, 104, 075	28, 271, 902	21, 346, 251	64, 408, 274	37, 349, 936	[4] 20, 712, 932	[4] 6, 758, 803	197, 051, 726	115, 176, 543
Average value		2. 09		0. 40		0. 76		0. 58		0. 33		0. 58

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[1] Included under "Undistributed."

[2] Includes items entered as "(1)."

[3] Includes 1,971,788 tons of sand, valued at $563,759, used for railroad ballast; some sand used by the railroads and others for fills, bank widening, and stock-car bedding; and some miscellaneous material.

[4] Includes some gravel used by the railroads for fills and other purposes. The quantity of gravel reported as used exclusively for railroad ballast was 16,227,543 tons, valued at $5,554,684.

VALUES

There were increases in average values for all classes of sand and gravel except building sand, paving sand, and paving gravel. The average value for the total output sold or used by producers was 58 cents in 1930, as compared with 60 cents in 1929. The washed and screened sand and gravel, considered alone, averaged 65 cents a ton, the same as in 1929.

Average value per short ton of sand and gravel sold or used by producers in the United States, 1921–1930

[Based on amounts received for sales f. o. b. pits or nearest shipping points]

Kind	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Glass sand	$1.81	$1.62	$1.84	$1.71	$1.64	$1.59	$1.50	$1.49	$1.71	$1.74
Molding sand	1.29	1.17	1.21	1.13	1.08	1.06	1.06	1.06	1.03	1.06
Building sand	.65	.60	.61	.57	.58	.55	.54	.53	.57	.56
Paving sand	.63	.61	.59	.56	.55	.54	.50	.49	.52	.51
Grinding and polishing sand	1.61	1.46	1.62	1.54	1.38	1.35	1.30	1.30	1.41	1.45
Fire or furnace sand	1.56	1.42	1.45	1.23	1.14	1.06	1.10	1.18	1.10	1.29
Engine sand	.86	.76	.76	.66	.62	.61	.63	.64	.64	.69
Filter sand	1.11	1.99	1.20	2.01	2.34	2.13	2.08	1.99	2.00	2.09
Railroad ballast gravel [1]	.33	.36	.29	.31	.33	.34	.33	.30	.31	.33
Gravel (exclusive of railroad ballast)	.75	.72	.72	.70	.70	.70	.69	.65	.68	.63
All sand and gravel	.71	.68	.65	.62	.63	.61	.59	.57	.60	.58

[1] Includes some gravel used by the railroads for fills and other purposes. The average value per ton for the gravel used exclusively for railroad ballast was $0.31 in 1928, $0.32 in 1929, and $0.34 in 1930.

GLASS SAND

The production of glass sand in 1930 amounted to 1,849,101 short tons, valued at $3,210,973, a decrease of 17 per cent in quantity and 15 per cent in value as compared with 1929. Glass sand was produced in 1930 in 20 States, of which the largest producers, listed in order of quantity, were Illinois, West Virginia, Pennsylvania, Missouri, and New Jersey. The output of glass sand in these States ranged from 489,824 short tons in Illinois to 119,410 tons in New Jersey. The States leading in total value of glass-sand production were West Virginia, Pennsylvania, Illinois, New Jersey, Missouri, and Ohio, the total ranging from $967,434 in West Virginia to $190,182 in Ohio.

The average value per short ton f. o. b. plant or pit for the total output of glass sand in 1930 was $1.74, as compared with $1.71 in 1929. The average value for the total glass-sand output of the individual States in 1930 ranged from 35 cents to $5.20 a short ton, as compared with 32 cents to $5.95 in 1929.

Glass sand sold or used by producers in the United States, 1921–1930

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average			Total	Average
1921	1,280,359	$2,314,314	$1.81	1926	2,274,218	$3,615,371	$1.59
1922	1,768,549	2,866,366	1.62	1927	2,171,693	3,257,790	1.50
1923	2,034,958	3,751,778	1.84	1928	2,310,828	3,435,645	1.49
1924	2,169,899	3,718,973	1.71	1929	2,219,677	3,788,471	1.71
1925	2,334,921	3,836,085	1.64	1930	1,849,101	3,210,973	1.74

MOLDING SAND

The output of molding sand in 1930 was 3,336,855 short tons, valued at $3,547,154, a decrease of 46 per cent in quantity and 45 per cent in value as compared with 1929, when production set a new high record. The quantity and value of the 1930 production were smaller than for any year since 1921.

Molding sand was reported from 34 States in 1930. The leading producing States, in order of quantity, were Illinois, Michigan, Ohio, New Jersey, New York, Pennsylvania, and Indiana, the output of these States ranging from 589,238 short tons in Illinois to 187,466 tons in Indiana. The States leading in total value of molding sand were Ohio, New Jersey, New York, Illinois, Pennsylvania, Michigan, and Indiana, the value of the output in these States ranging from $713,043 in Ohio to $128,343 in Indiana.

The average value per ton f. o. b. plant or pit for the total output of molding sand in 1930 was $1.06—the same as for the three years 1926 to 1928—as compared with $1.03 in 1929. The average value for the total output of molding sand in the individual States in 1930 ranged from 17 cents to $5.23 a short ton.

Molding sand sold or used by producers in the United States, 1921–1930

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average			Total	Average
1921	1,906,977	$2,451,966	$1.29	1926	5,309,166	$5,630,799	$1.06
1922	3,839,116	4,478,405	1.17	1927	4,194,975	4,458,508	1.06
1923	5,559,644	6,730,417	1.21	1928	4,781,765	5,089,969	1.06
1924	4,403,893	4,995,268	1.13	1929	6,195,343	6,410,343	1.03
1925	4,995,428	5,400,618	1.08	1930	3,336,855	3,547,154	1.06

IMPORTS

Imports of sand and gravel for consumption in the United States, as recorded by the Bureau of Foreign and Domestic Commerce, amounted to 1,832,850 short tons, valued at $719,345, in 1930, an increase of 10 per cent in quantity but a decrease of 4 per cent in value compared with 1929. The imports of glass sand recorded for 1930 amounted to 24,700 short tons, valued at $42,203. No imports of glass sand were recorded for 1929. Imports of sand classified as "Sand, other than glass" and "Sand not specially provided for" together amounted to 1,359,254 short tons, valued at $474,174, in 1930. Imports of gravel declined from 559,413 short tons, valued at $305,343, in 1929 to 448,896 short tons, valued at $202,968, in 1930.

From the accompanying table on "general imports" of sand and gravel by countries it will be seen that Canada was the source of 95 per cent of the sand and gravel imported in 1930; moreover, although shipments of these materials from Canada increased in quantity, those from the other countries decreased in 1930, except for a negligible tonnage received from Japan. As usual, Belgium was the second most important source of foreign sand and gravel. Other countries that imported sand and gravel into the United States in 1930 were Mexico, France, Netherlands, United Kingdom, British India, Germany, and Japan.

The values given for imports represent the foreign market value (or the export value, if higher) plus the cost of containers and all expenses incident to placing merchandise ready for shipment to the United States, including the export tax, if any.

Sand and gravel imported for consumption in the United States, 1921–1930

Year	Short tons	Value	Year	Short tons	Value
1921	906,905	$771,734	1926	947,579	$341,911
1922	451,943	238,386	1927	736,271	302,551
1923	477,762	259,820	1928	788,222	392,111
1924	701,410	280,206	1929	1,666,387	751,602
1925	534,555	233,422	1930	1,832,850	719,345

Sand and gravel imported for consumption in the United States, 1928–1930, by classes

Class	1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value
Glass sand [1]	43,137	$35,689			24,700	$42,203
Other sand	385,848	189,072	1,106,974	$446,259	[2] 1,359,254	[2] 474,174
Gravel	359,237	167,350	559,413	305,343	448,896	202,968
	788,222	392,111	1,666,387	751,602	1,832,850	719,345

[1] Beginning June 18, 1930, classification reads "Sand containing 95 per cent silica and not more than 6/10 per cent oxide of iron and suitable for manufacture of glass."

[2] Includes 793,009 tons of "Sand, other than glass," valued at $252,380, imported June 18 to Dec. 31; not separately recorded prior to change in tariff.

Sand and gravel imported into the United States, 1928–1930, by countries

[General imports]

Country	1928		1929		1930	
	Short tons	Value	Short tons	Value	Short tons	Value
North America:						
Canada	690,358	$261,805	1,539,883	$625,385	1,743,093	$597,477
Dominican Republic	2	50				
Mexico	9,453	6,808	54,656	15,511	2,749	1,605
South America: Brazil	58	2,666				
Europe:						
Belgium	81,089	70,705	87,457	65,019	85,110	99,109
France	1,098	6,848	1,214	10,948	980	6,906
Germany	6	199	1,786	1,922	101	3,826
Italy	2	21				
Netherlands	1,139	8,323	519	5,916	456	5,116
Norway			1	5		
Sweden	29	159				
United Kingdom	339	2,246	296	2,520	183	4,890
Asia:						
China			(1)	8		
India (British)	4,647	32,257	2,573	24,363	167	366
Japan	1	14			11	50
Palestine	1	10				
Africa: Liberia			(1)	5		
	788,222	392,111	1,688,385	751,602	1,832,850	719,345

(1) Less than 1 ton.

EXPORTS

Exports of sand and gravel in 1930 amounted to 323,090 short tons, valued at $570,107, a decrease of 34 per cent in quantity and 30 per cent in value as compared with 1929.

Sand and gravel exported from the United States, 1921–1930

Year	Short tons	Value	Year	Short tons	Value
1921	(1)	$379,982	1926	424,374	$610,023
1922	356,520	400,199	1927	421,243	557,644
1923	551,233	598,633	1928	737,368	638,288
1924	314,140	401,662	1929	486,378	809,831
1925	425,612	496,050	1930	323,090	570,107

[1] Quantity not recorded prior to 1922.

MICA[1]

By B. H. Stoddard [2]

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INTRODUCTION

Mica is a name applied to a group of minerals that have similar physical properties and related chemical structure. Production in the United States of the minerals composing this group is limited almost entirely to muscovite.

The properties that give muscovite and other varieties of mica their value are perfect cleavage and the toughness, flexibility, and elasticity of cleavage sheets. These properties, combined with transparency, high dielectric strength, resistance to heat, and other qualities possessed by some varieties, render mica valuable for industrial uses. Muscovite may be white, gray, or yellow, inclining to amber, brown, red, or green.

New Hampshire and North Carolina are the principal sources of domestic mica. Canada, the Union of South Africa, and British India are the most important foreign sources. Canada and Madagascar produce the variety of mica known as phlogopite, whereas the Union of South Africa and British India produce muscovite in larger proportion.

As the domestic production of mica is not sufficient to meet the demand the United States is dependent on foreign supplies of mica, which are obtained principally from the countries already noted.

Information on the commercial varieties and uses of mica and on the minerals and materials allied to mica may be found in the report of this series for 1929.

PRODUCTION

General.—The total quantity of uncut mica sold by producers in the United States in 1930 was 7,465 short tons, valued at $286,407. In comparison with 1929 these figures (including sheet and scrap mica) show an increase of 2.7 per cent in quantity and a decrease of 29.1 per cent in value. The decline in total value is due partly to the inclusion in total sales for 1930 of a larger proportion of scrap mica than in 1929. Of the total quantity sold, 733 short tons (1,465,485 pounds), valued at $177,307, was sheet mica, including 1,253,782 pounds of punch mica, valued at $61,230, and 211,703 pounds of mica larger than punch, valued at $116,077. A very small quantity of uncut domestic splittings was reported by one producer and included in the sales of sheet mica. In addition to sales of sheet mica, 6,732 short tons of scrap mica, valued at $109,100, were sold in 1930.

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[1] Work on manuscript completed October, 1931.

[2] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Domestic mica sold by producers in the United States, 1921–1930

Year	Sheet mica						Scrap mica		Total	
	Uncut punch mica		Uncut mica larger than punch		Total uncut sheet mica					
	Pounds	Value	Pounds	Value	Pounds	Value	Short tons	Value	Short tons	Value
1921	675,787	$67,516	66,058	$50,997	741,845	$118,513	2,577	$56,849	2,948	$175,362
1922	911,433	71,127	166,535	123,174	1,077,968	194,301	[1] 6,641	114,045	[1] 7,180	308,346
1923	1,793,749	134,955	269,430	176,225	2,063,179	311,180	[1] 8,054	129,695	[1] 9,086	440,875
1924	1,305,219	113,285	155,678	98,750	1,460,897	212,035	4,709	87,242	5,439	299,277
1925	790,183	75,528	1,003,682	246,434	1,793,865	321,962	9,695	173,537	10,592	495,499
1926	1,842,970	228,053	329,189	172,131	2,172,159	400,184	7,043	136,643	8,129	536,827
1927	1,314,742	95,011	197,750	117,471	1,512,492	212,482	6,280	110,139	7,036	322,621
1928	1,468,482	90,931	213,295	140,025	1,681,777	230,956	7,760	132,422	8,601	363,378
1929	1,752,044	98,989	283,084	187,332	2,035,128	286,321	6,253	117,901	7,271	404,222
1930	1,253,782	61,230	211,703	116,077	1,465,485	177,307	6,732	109,100	7,465	286,407

[1] Includes mica derived from mica schist.

Mica sold by producers in chief producing States, 1926–1930

State and year	Sheet mica						Scrap mica		Total	
	Uncut punch mica		Uncut mica larger than punch		Total uncut sheet mica					
	Pounds	Value	Pounds	Value	Pounds	Value	Short tons	Value	Short tons	Value
New Hampshire:										
1926	1,220,053	$188,850	151,837	$47,040	1,371,890	$235,890	1,738	$38,213	2,424	$274,103
1927	674,219	60,744	46,000	18,105	720,219	78,849	1,284	22,909	1,644	101,758
1928	727,775	45,354	46,368	18,116	774,143	63,470	1,291	25,232	1,678	88,702
1929	913,552	48,885	71,226	33,772	984,778	82,657	1,657	35,977	2,149	118,634
1930	616,204	29,275	56,860	24,029	673,064	53,304	449	8,743	786	62,047
North Carolina:										
1926	541,990	33,847	158,323	116,515	700,313	150,362	2,880	54,048	3,230	204,410
1927	528,978	27,347	136,382	87,167	665,360	114,514	2,995	50,505	3,328	165,019
1928	640,585	33,326	136,810	96,380	777,395	129,706	4,419	69,638	4,808	199,344
1929	737,473	40,081	156,727	110,212	894,200	150,293	3,245	53,855	3,692	204,148
1930	610,216	30,567	138,858	81,884	749,074	112,451	4,744	75,400	5,119	187,851

Sheet mica.—Sheet mica comprises punch mica, mica larger than punch, and splittings. The sales of punch mica decreased 28.4 per cent in quantity and 38.1 per cent in value as compared with 1929, and those for mica larger than punch declined 25.2 per cent in quantity and 38 per cent in value. Total sales of uncut sheet mica decreased 28 per cent in quantity and 38.1 per cent in value as compared with 1929.

The average value per pound of uncut punch mica sold in 1930 was about 5 cents and that of mica larger than punch about 55 cents.

Mica splittings.—The United States produces a very small amount of mica splittings, which are used in the manufacture of built-up mica. Consequently, by far the larger proportion of its domestic requirements is obtained from other countries, chiefly from India and Canada. In 1930 the total quantity of uncut splittings (domestic and foreign) consumed in the United States was 3,035,880 pounds, valued at $1,265,137, as compared with 3,782,287 pounds, valued at $2,449,889, in 1929. Built-up mica is used for many of the same purposes as sheet mica, and as much improvement has been made in the manufacture of built-up mica the finished product competes sharply with sheet mica. The total average value per pound of uncut mica splittings consumed in the United States in 1930 was about 40 cents; the total average value per pound of domestic uncut sheet mica was about 12 cents.

The consumers of uncut mica splittings in the United States in 1930 are given in the following list.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Chicago Mica Co., Valparaiso, Ind.
General Electric Co., Schenectady, N. Y.
The Macallen Co., 16 Macallen Street, Boston, Mass.
Mica Insulator Co., 68 Church Street, New York, N. Y.
New England Mica Co., 66 Woerd Avenue, Waltham, Mass.
Western Electric Co., Hawthorne Station, Chicago, Ill.
Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Scrap and ground mica.—Approximately 90 per cent of the total commercial production of mica in the United States in 1930 was scrap mica. It is usually ground to a powder and used in various ways. The following tables show the distribution of the 1930 sales of ground mica in the United States, by methods of grinding and by consuming industries, in so far as data have been reported by producers.

In Mitchell County, N. C., commercial production of mica was obtained as a by-product of clay washings. As this product, after being screened, dried, and sized, is sold and used in the roofing industry for the same purposes as ground mica, figures of production have been included with those for both scrap and ground mica.

Ground mica sold in the United States, 1926–1930, by methods of grinding

Year	Dry ground		Wet ground		Total	
	Pounds	Value	Pounds	Value	Pounds	Value
1926	4, 750, 790	$98, 290	4, 980, 400	$206, 370	9, 731, 190	$304, 660
1927	5, 187, 063	90, 968	6, 398, 320	332, 511	11, 585, 383	423, 479
1928	5, 743, 052	95, 151	6, 633, 965	358, 458	12, 377, 017	453, 609
1929	3, 637, 192	62, 029	5, 395, 005	328, 332	9, 032, 197	390, 361
1930 [1]	11, 912, 232	190, 635	3, 149, 545	161, 623	15, 061, 777	352, 258

[1] Includes sales of mica suitable for roofing purposes without grinding.

Ground mica sold to various industries in the United States in 1930

Industry	Quantity		Value
	Pounds	Per cent of total	
Roofing [1]	9, 651, 025	64	$135, 076
Wall paper	1, 939, 645	13	104, 197
Rubber	1, 012, 200	7	53, 810
Miscellaneous [2]	2, 458, 907	16	59, 175
	15, 061, 777	100	352, 258

[1] Includes sales of mica suitable for roofing purposes without grinding.

[2] Figures cover mica used for molded electric insulation, surfacing on asphalt shingles, filler for fancy paints, ornamental tile, Christmas-tree snow, manufacture of axle greases and oil, annealing. concrete and foundry facing, calico printing, and plastic specialties.

PRICES

Prices of mica in 1930 on the whole varied little during the year. In comparison with 1929, however, they were considerably lower, and in several instances were below the point at which some of the producers could make a profit. In 1930 the range of prices per pound for rough-trimmed uncut sheet mica, as reported to the Bureau of Mines by producers and others engaged in the industry, was as follows:

Range of prices per pound for rough-trimmed uncut sheet mica in 1930

Size	Clear	Stained	Size	Clear	Stained
Punch	$0.04-$0.06	$0.03-$0.05	3 by 4 inches	$1.30-$1.70	$0.85-$1.30
1½ by 2 inches	.25- .30	.10- .25	3 by 5 inches	1.45- 2.00	1.15- 1.60
2 by 2 inches	.40- .50	.25- .40	4 by 6 inches	1.80- 2.75	1.35- 2.00
2 by 3 inches	.75- .80	.40- .60	6 by 8 inches	2.00- 4.00	
3 by 3 inches	1.15- 1.35	.65- 1.10	8 by 10 inches		

REVIEW BY STATES

North Carolina and New Hampshire produced 79 per cent of all mica mined and sold in the United States in 1930.

North Carolina.—North Carolina outranked all other States in 1930 in commercial output of mica. The production of sheet mica, however, decreased 16 per cent in quantity and 25 per cent in value as compared with 1929. Sales of scrap mica increased 46 per cent in quantity and 40 per cent in value as compared with 1929.

Producers in North Carolina who reported sales of mica in 1930 follow.

D. Buchanan, Spear, N. C.
Carolina Mineral Co., Spruce Pine, N. C.
Odes Elmore, Casar, N. C.
English Mica Co., Spruce Pine, N. C.
Franklin Mineral Products Co., Franklin, N. C.
General Mica Co., Penland, N. C.
J. P. Grindstaff, Lotta, N. C.
Harris Clay Co., Dillsboro, N. C.
North State Feldspar Corporation, Micaville, N. C.
J. C. Pitman, Penland, N. C.
Rickman, Wright, Reuss & Sisk, Franklin, N. C.
Southern Mica Co., Franklin, N. C.
Spruce Pine Mica Co., Spruce Pine, N. C.
Tennessee Mineral Products Co., 10 East Fortieth Street, New York, N. Y.
D. T. Vance, Plumtree, N. C.

Sales of mica schist were reported by the Victor Mica Co., Spruce Pine, N. C.

New Hampshire.—In 1930 New Hampshire ranked second in total marketed production of mica, which was reported to have been mined in Cheshire, Grafton, and Merrimack Counties by the following producers:

General Electric Co., Schenectady, N. Y.
New England Mica Co., 66 Woerd Avenue, Waltham, Mass.
New Hampshire Mica & Mining Co., Keene, N. H.
The Whitehall Co. (Inc.), 17 Battery Place, New York, N. Y.

The total output of sheet mica decreased 32 per cent in quantity and 36 per cent in value as compared with 1929, while sales of scrap mica decreased 73 per cent in quantity and 76 per cent in value.

Other States.—In addition to New Hampshire and North Carolina, mica was reported to have been produced and sold in 1930 in Alabama, Colorado, Connecticut, Georgia, Maine, New Mexico, South Carolina, South Dakota, and Virginia.

IMPORTS AND EXPORTS

Figures on mica imported for consumption in the United States in 1930 are given in two groups—those for the first six months, which are classified according to the tariff act of 1922, and those for the last six months, which are classified according to the new tariff act, which became effective June 18, 1930.

Mica imported for consumption in the United States in 1930, by kinds

Kind	Duty		Total imported	
	Per pound	Ad valorem	Pounds	Value
January 1 to June 17				
Unmanufactured:	*Cents*	*Per cent*		
Valued at not above 15 cents per pound	4		212,418	$28,008
Valued at above 15 cents per pound		25	408,574	251,905
			620,992	279,913
Manufactured:				
Mica splittings		30	1,125,106	359,185
Cut mica (dimension sheets)		30	51,743	71,019
Ground mica		20	182	4
Built-up mica board, cups, tubes, and plates		40	3,059	2,465
Washers		30	781	242
Manufactures (n. s. p. f.)		40	837	363
			1,181,708	433,278
June 18 to December 31				
Unmanufactured:				
Waste and scrap, valued at not more than 5 cents per pound [1]		25	3,676,682	20,510
Untrimmed phlogopite mica from which rectangular pieces not exceeding in size 1 inch by 2 inches may be cut		15	80,087	10,412
Other—				
Valued at not above 15 cents per pound	4		13,193	1,568
Valued at above 15 cents per pound	4	25	158,507	93,357
			3,928,469	125,847
Manufactured:				
Cut mica		40	20,659	29,479
Films and splittings—				
Not cut or stamped to dimensions—				
Not above 12 ten-thousandths of an inch in thickness		25	1,182,300	382,347
Over 12 ten-thousandths of an inch in thickness		40	18,289	19,111
Cut or stamped to dimensions		45	1,085	6,771
Mica plates and built-up mica		40	2,942	6,034
All manufactures of which mica is the component material of chief value		40	1,195	783
Mica ground or pulverized		20	506	53
			1,226,976	444,578
			6,958,145	1,283,616

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[1] Not included in figures for mica prior to June 18, 1930.

The accompanying table shows the countries from which the mica imported into the United States in 1930 was last shipped.

Mica imported into the United States in 1930, by kinds and by countries

[General imports]

Country	Unmanufactured				Manufactured									
	Valued at not above 15 cents per pound (duty 4 cents per pound)		Valued at above 15 cents per pound (duty 25 per cent)		Cut mica, dimension sheets (duty 30 per cent)		Mica splittings (duty 30 per cent)		Ground mica (duty 20 per cent)		Built-up mica board, cups, tubes, and plates (duty 40 per cent)		Manufactures, not specially provided for (duty 40 per cent)	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
January 1 to June 17														
Argentina	692	$96	12,653	$6,258										
Brazil	4,704	259	8,246	4,930	222	$117							228	$109
Canada	200,898	26,886	2,903	1,459	53	49	4,250	$2,741	182	$4	12	$9	9	13
France			12,058	7,642	6,233	30,828	77,530	19,273						
Germany			7,173	3,692	5,736	11,583					3,521	2,750		
Guatemala	893	76												
India, British	1,000	88	254,233	183,509	15,352	10,220	987,810	326,345					300	153
Italy			100	176										
Madagascar			640	392			43,903	8,383						
Switzerland					3,560	753								
United Kingdom	2,500	304	71,657	64,444	2,730	5,434	87,095	36,053						
	210,687	27,709	369,663	272,502	33,886	58,984	1,200,588	392,795	182	4	3,533	2,759	537	275

Country	Unmanufactured								Manufactured													
	Waste and scrap, valued at not more than 5 cents per pound [1] (duty 25 per cent)		Untrimmed phlogopite mica from which rectangular pieces not exceeding in size 1 inch by 2 inches may be cut (duty 15 per cent)		Other				Cut mica (duty 40 per cent)		Films and splittings						Mica plates and built-up mica (duty 40 per cent)		All manufactures of which mica is the component material of chief value (duty 40 per cent)		Mica ground or pulverized (duty 20 per cent)	
					Valued at not above 15 cents per pound (duty 4 cents per pound)		Valued at above 15 cents per pound (duty 4 cents per pound+25 per cent)				Not cut or stamped to dimensions				Cut or stamped to dimensions (duty 45 per cent)							
											Not above 12 ten-thousandths of an inch in thickness (duty 25 per cent)		Over 12 ten-thousandths of an inch in thickness (duty 40 per cent)									
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
June 18 to December 31																						
Argentina	------	------	------	------	3, 130	$355	19, 548	$10, 494	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Brazil	------	------	------	------	9, 983	1, 195	16, 214	4, 997	1, 210	$660	------	------	------	------	------	------	------	------	------	------	------	------
Canada	1, 648, 864	$9, 466	80, 087	$10, 412	416	33	1, 163	597	------	------	65, 758	$27, 667	------	------	------	------	60	$78	5	$55	------	------
France	------	------	------	------	------	------	110	206	1, 676	7, 873	85, 237	18, 032	------	------	------	------	1, 148	4, 865	60	112	------	------
Germany	------	------	------	------	------	------	5, 996	3, 122	6, 481	8, 216	97	299	------	------	843	$5, 838	244	328	30	62	506	$53
India, British	224, 000	1, 078	------	------	7, 827	1, 126	95, 125	73, 142	10, 577	9, 491	1, 265, 813	391, 818	16, 214	$19,043	500	292	1, 365	2, 343	------	------	------	------
Japan	------	------	------	------	------	------	------	------	------	------	400	95	------	------	------	------	------	------	------	------	------	------
Madagascar	------	------	------	------	------	------	169	135	------	------	40, 701	7, 797	------	------	------	------	------	------	------	------	------	------
Switzerland	------	------	------	------	------	------	------	------	------	------	------	------	------	------	67	282	------	------	------	------	------	------
Union of South Africa	1, 808, 675	9, 966	------	------	------	------	592	570	------	------	------	------	------	------	------	------	------	------	------	------	------	------
United Kingdom	------	------	------	------	------	------	53, 046	25, 947	2, 081	4, 113	50, 414	22, 886	400	470	16	111	140	23	------	------	------	------
	3, 681, 539	20, 510	80, 087	10, 412	21, 356	2, 709	191, 963	119, 210	22, 025	30, 353	1, 508, 420	468, 594	16, 614	19, 513	1, 426	6, 523	2, 957	7, 637	95	229	506	53

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[1] Not included in figures for mica prior to June 18, 1930.

Mica imported into the United States in 1930, by kinds and by countries

[General imports]

Country	Unmanufactured		Cut or split		Manufactured	
	Pounds	Value	Pounds	Value	Pounds	Value
Argentina	36,023	$17,203				
Brazil	39,147	11,381	1,210	$660	450	$226
Canada	1,934,331	48,853	70,008	30,408	321	208
France	12,168	7,848	164,443	45,178	7,441	35,805
Germany	13,169	6,814	7,421	14,353	10,037	14,776
Guatemala	893	76				
India, British	582,185	258,943	2,280,914	746,989	17,017	12,716
Italy	100	176				
Japan			400	95		
Madagascar	809	527	84,604	16,180		
Switzerland			67	282	3,560	753
Union of South Africa	1,809,267	10,536				
United Kingdom	127,203	90,695	140,006	63,633	2,870	5,457
	4,555,295	453,052	2,749,073	917,778	41,696	69,941

Mica and manufactures of mica exported in 1930 amounted to 4,732,864 pounds, valued at $262,826, as compared with 6,187,270 pounds, valued at $329,322, in 1929. As the classes of mica are not shown in export schedules, it is impossible to state what kinds of mica are exported.

Mica exported from the United States in 1930, by countries

Country	Pounds	Value
North America:		
Canada	3,246,730	$79,703
Central America—		
British Honduras	24	8
Costa Rica	78	108
Guatemala	15	67
Honduras	28	30
Nicaragua	1	2
Panama	474	288
Mexico	5,257	3,190
Miquelon and St. Pierre Islands	198	38
Newfoundland and Labrador	116	294
West Indies—		
British—		
Jamaica	45	54
Other	148	38
Cuba	1,737	954
Dominican Republic	261	260
Haiti	9	26
Netherland	145	69
South America:		
Argentina	5,081	2,890
Bolivia	19	97
Brazil	1,835	2,371
Chile	677	1,379
Colombia	234	264
Ecuador	205	150
Guiana, British	22	23
Peru	72	240
Uruguay	57	307
Venezuela	13	105
Europe:		
Belgium	191,517	12,191
Czechoslovakia	3,058	2,676
Finland	326	98
France	110,891	7,291
Germany	224,323	15,150
Italy	10,228	1,513
Europe—Continued.		
Netherlands	1,306	$2,628
Norway	358	136
Poland and Danzig	406	61
Portugal	45	15
Soviet Russia	107	1,073
Spain	122	311
Sweden	5,530	573
Switzerland	44	100
United Kingdom	865,245	93,467
Asia:		
Ceylon	9	25
China	6,252	6,010
East Indies—		
British—		
India	7,793	6,934
Malaya (Straits Settlements)	1,012	255
Hong Kong	24	8
Japan (including Chosen)	15,533	12,859
Java and Madura	70	40
Philippine Islands	371	601
Siam	22	47
Turkey	48	8
Africa:		
British—		
East	192	74
Nigeria	27	151
Union of South Africa	3,220	2,038
Portuguese—		
Mozambique	48	20
Other	40	53
Oceania:		
British—		
Australia	21,016	3,284
New Zealand	193	156
Other	6	18
French	1	7
	4,732,864	262,826

WORLD PRODUCTION

World production of mica, 1926–1930, in metric tons

[Compiled by M. T. Latus, of the Bureau of Mines]

Country [1]	1926	1927	1928	1929	1930
North America:					
Canada (sales)	2,309	2,484	3,320	3,677	1,061
Guatemala	12	7	[2] 13	[2] 1	(3)
United States (sales)	7,374	6,383	7,803	6,596	6,772
South America:					
Argentina [4]	99	106	120	119	100
Bolivia [2]	25	17	11	2	15
Brazil [2]	52	39	44	45	52
Europe:					
Norway [2]	42	8	85	59	(3)
Russia [5]	65	15	266	(3)	(3)
Sweden	53	10	12	66	(3)
Asia:					
Chosen	16	35	29	26	29
India, British [6]	4,569	3,937	4,850	5,897	4,212
Russia [5]	421	1,505	1,227	(3)	(3)
Africa:					
Ethiopia	--------	2	--------	--------	--------
Kenya Colony and Protectorate	--------	--------	(7)	2	--------
Madagascar [8]	330	505	861	380	348
Rhodesia—					
Northern	4	8	4	3	4
Southern	166	186	186	172	164
Tanganyika Territory	53	43	34	29	21
Union of South Africa (Transvaal) (sales)	872	1,454	3,419	1,464	501
Oceania:					
Australia—					
Central Australia [9]	3	2	23	24	26
North Australia [9]		--------	--------	--------	--------
Queensland	--------	1	--------	--------	--------
South Australia	--------	--------	2	--------	--------
Western Australia [2]	4	4	--------	--------	--------

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[1] In addition to the countries listed France reports a production of 1 ton in 1926 and New South Wales a production of 3 tons in 1929.

[2] Exports.

[3] Data not available.

[4] Rail and river shipments.

[5] Year ended Sept. 30.

[6] Exports. The figures for output are incomplete, and a more accurate idea of the size of the industry is to be obtained from the export figures. (Rec. Geol. Surv. of India, vol. 59, pt. 3, p. 273. Calcutta, 1926.) Output is reported as follows: 1926, 2,130 tons; 1927, 2,165 tons; 1928, 2,292 tons; 1929, 2,704 tons; 1930, 2,679 tons.

[7] Less than 1 ton.

[8] Exports reported as follows: 1926, 296 tons; 1927, 544 tons; 1928, 635 tons; 1929, 427 tons; 1930, 397 tons.

[9] Northern Territory prior to division in 1927 into Central Australia and North Australia.

CEMENT[1]

By B. W. Bagley

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GENERAL REVIEW

Early in January, 1931, the Bureau of Mines published a summary of the monthly estimates of output of Portland cement in 1930, compiled from the monthly reports of producers. These preliminary figures, which indicated a production of about 160,905,000 barrels and shipments of about 158,744,000 barrels, were each within 0.2 per cent of the final figures for the year. The production of Portland cement in 1930—161,197,228 barrels—decreased 6 per cent from 1929 and nearly 9 per cent from 1928, the year of highest production. The decreases in 1929 and 1930 were the only two recorded in the yearly production since 1921.

Shipments from the mills in 1930 amounted to 159,059,334 barrels, valued at $228,779,756, decreases from the preceding year of 6 per cent in quantity and of more than 9 per cent in gross value. The average factory value per barrel, in bulk, in 1930 was $1.44, a decline of 4 cents per barrel as compared with 1929.

The stocks of finished Portland cement at the mills increased, reaching a total of 25,838,427 barrels on December 31, 1930. They were 9 per cent higher than at the end of 1929 and represented the largest stocks on hand at the end of any year during which official records of this item have been kept. At the end of December, 1930, according to estimates by the manufacturers, 8,809,000 barrels of clinker or unground cement were also on hand at the mills, as compared with 7,526,000 barrels at the end of 1929.

The monthly production in 1930 continued the decline begun in the early months of 1929 and was lower than in 1929 except in March, May, and June, when increases were recorded. Also, monthly shipments in 1930 were considerably lower than in the preceding year, except in February, when there was a noticeable increase—nearly 29 per cent—and in April and May, when the increases were slight.

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[1] Work on manuscript completed October, 1931.

The increases in these three months caused a slight increase in the total shipped during the first five months of the year over that in the corresponding period in 1929. In 1930, as in the three preceding years, both shipments and production of Portland cement reached their maximum in August.

At the end of October, when reserves of both finished cement and clinker or unground cement were lowest, about 20,697,000 barrels of finished cement and 7,266,000 barrels of clinker were in stock at the mills. The monthly average for the finished cement stocks for the year was nearly 26,558,000 barrels and for the clinker stocks, 10,882,000 barrels, as compared with 24,406,000 barrels and 10,685,000 barrels, respectively, for 1929.

Production and shipments of natural and puzzolan cements, including masonry cements of the natural cement class, also decreased in 1930. The output declined nearly 19 per cent, and shipments were more than 17 per cent below those for 1929.

The general trend of building construction during the years 1927 to 1930 is shown by the following table, which summarizes the value of buildings as shown by permits issued during those years in 213 cities representing all parts of the United States. The grand totals for the four years decreased successively. All districts shared in the total decrease of 43 per cent in 1930 from 1929, the declines ranging from 18 to 56 per cent for the separate areas.

Value of buildings shown by permits issued in 213 cities in the United States, 1927–1930 [1]

Group of cities in—	1927	1928	1929	1930	Decrease, 1930 from 1929 (per cent)
New England	$189,914,000	$177,570,000	$168,754,000	$112,533,000	33
Northern New Jersey, metropolitan New York, and vicinity	1,052,186,000	1,072,774,000	1,046,326,000	463,234,000	56
New York State (except Long Island, Westchester, Orange, Putnam, and Rockland Counties)	116,111,000	89,678,000	76,820,000	55,146,000	28
Eastern Pennsylvania, southern New Jersey, Maryland, Delaware, District of Columbia, and Virginia	259,855,000	275,704,000	252,137,000	156,263,000	38
Western Pennsylvania, West Virginia, Ohio, and Kentucky	253,651,000	254,880,000	208,338,000	153,854,000	26
Southern Michigan	203,222,000	180,730,000	145,635,000	64,536,000	56
Northern Illinois, Indiana, Iowa, and eastern and southern Wisconsin	510,616,000	462,371,000	336,539,000	163,811,000	51
Minnesota, North and South Dakota, northern Michigan, and northwest Wisconsin	41,295,000	37,989,000	38,512,000	31,656,000	18
Southern Illinois, eastern Missouri, northeastern Arkansas, western Tennessee, and northwest Mississippi	72,357,000	73,977,000	48,430,000	37,921,000	22
Western Missouri, Kansas, Oklahoma, and Nebraska	66,539,000	72,828,000	79,555,000	64,268,000	19
Texas	95,295,000	86,283,000	86,838,000	68,243,000	21
Louisiana, western and southern Arkansas, eastern and southern Mississippi	23,877,000	21,557,000	20,606,000	12,090,000	41
North and South Carolina, Georgia, Florida, Alabama, and eastern Tennessee	116,527,000	117,803,000	73,170,000	44,850,000	39
Colorado, Utah, Montana, Idaho, Wyoming, and New Mexico	30,234,000	30,982,000	33,308,000	17,955,000	46
Arizona, California, Washington, and Oregon	334,657,000	292,699,000	257,590,000	202,798,000	21
	3,366,336,000	3,247,825,000	2,872,558,000	1,649,158,000	43

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[1] From Bulletin of Portland Cement Association, showing values tabulated in detail by cities, based on Bradstreet's and S. W. Straus & Co. building statistics.

The following table summarizes the value of contracts awarded in Eastern and Central States for buildings of all classes and for engineering construction of all other kinds, including public works.

Value of contracts awarded for building and all other construction work in Eastern and Central States, 1927–1930 [1]

Group of States	1927	1928	1929	1930	Increase or decrease, 1930 from 1929 (per cent)
New England	$412, 767, 000	$495, 581, 000	$398, 382, 000	$354, 466, 000	−11
Northern New Jersey, metropolitan New York, and vicinity	1, 401, 973, 000	1, 564, 615, 000	1, 241, 842, 000	938, 693, 000	−24
New York State (except Long Island, Westchester, Orange, Putnam, and Rockland Counties)	282, 472, 000	249, 702, 000	225, 430, 000	187, 764, 000	−17
Eastern Pennsylvania, southern New Jersey, Maryland, Delaware, District of Columbia, and Virginia	721, 148, 000	787, 673, 000	671, 500, 000	537, 961, 000	−20
Western Pennsylvania, West Virginia, Ohio, and Kentucky	758, 135, 000	723, 416, 000	685, 536, 000	567, 201, 000	−17
Southern Michigan	364, 482, 000	317, 999, 000	356, 411, 000	173, 537, 000	−51
Northern Illinois, Indiana, Iowa, and eastern and southern Wisconsin	1, 031, 962, 000	1, 120, 906, 000	873, 554, 000	550, 291, 000	−37
Minnesota, North and South Dakota, northern Michigan, and northwest Wisconsin	92, 374, 000	90, 092, 000	104, 554, 000	98, 712, 000	−6
Southern Illinois, eastern Missouri, northeast Arkansas, western Tennessee, and northwest Mississippi	230, 415, 000	277, 186, 000	237, 223, 000	245, 878, 000	+4
Western Missouri, Kansas, Oklahoma, and Nebraska	229, 415, 000	257, 978, 000	255, 208, 000	300, 034, 000	+18
Texas	219, 105, 000	231, 409, 000	217, 800, 000	186, 026, 000	−15
Louisiana, western and southern Arkansas, eastern and southern Mississippi	106, 262, 000	103, 513, 000	179, 877, 000	102, 037, 000	−43
North and South Carolina, Georgia, Florida, Alabama, and eastern Tennessee	452, 545, 000	408, 218, 000	303, 473, 000	268, 596, 000	−11
	6, 303, 055, 000	6, 628, 288, 000	5, 750, 790, 000	4, 511, 196, 000	−22

[1] From Bulletin of Portland Cement Association, based on compilations by F. W. Dodge Corporation.

CHIEF HYDRAULIC CEMENTS

The accompanying table gives statistics of output of Portland and other (masonry, natural, and puzzolan) hydraulic cements from 1921 to 1930. The quantity of these cements produced in the United States in 1930 decreased 6 per cent as compared with 1929; the shipments from the mills in 1930 decreased 6 per cent in quantity and more than 9 per cent in value.

Statistics of output of alumina cement, representing the operations of only one manufacturer in the United States, are not included in this or other tables of this report. No production of this type of cement was reported for 1923, but it was marketed from 1924 to 1930. The indications are that its use will increase steadily.

Principal hydraulic cements produced and shipped in the United States, 1921–1930

Year	Number of active plants	Production				
		Portland cement, barrels	Masonry, natural, and puzzolan cements		Total	
			Number of active plants	Barrels	Number of active plants	Barrels
1921	115	98, 842, 049	9	(1)	124	(1)
1922	118	114, 789, 984	9	(1)	127	(1)
1923	126	137, 460, 238	10	(1)	136	(1)
1924	132	149, 358, 109	10	(1)	142	(1)
1925	138	161, 658, 901	10	1, 729, 343	148	163, 388, 244
1926	140	164, 530, 170	11	2, 104, 891	151	166, 635, 061
1927	153	173, 206, 513	11	2, 123, 868	164	175, 330, 381
1928	156	176, 298, 846	11	2, 210, 404	167	178, 509, 250
1929	163	170, 646, 036	11	2, 209, 465	174	172, 855, 501
1930	163	161, 197, 228	11	1, 792, 083	174	162, 989, 311

Year	Shipments					
	Portland cement		Masonry, natural, and puzzolan cements		Total	
	Barrels	Value	Barrels	Value	Barrels	Value
1921	95, 507, 147	$180, 778, 415	539, 402	$897, 025	96, 046, 549	$181, 675, 440
1922	117, 701, 216	207, 170, 430	889, 428	1, 293, 598	118, 590, 644	208, 464, 028
1923	135, 912, 118	257, 684, 424	1, 271, 674	1, 947, 352	137, 183, 792	259, 631, 776
1924	146, 047, 549	264, 046, 708	1, 418, 461	2, 006, 559	147, 466, 010	266, 053, 267
1925	157, 295, 212	278, 524, 108	1, 751, 725	2, 551, 583	159, 046, 937	281, 075, 691
1926	162, 187, 090	277, 965, 473	2, 031, 851	2, 820, 110	164, 218, 941	280, 785, 583
1927	171, 864, 728	278, 854, 647	2, 158, 323	2, 881, 029	174, 023, 051	281, 735, 676
1928	175, 838, 332	275, 972, 945	2, 213, 645	2, 910, 097	178, 051, 977	278, 883, 042
1929	169, 868, 322	252, 153, 789	2, 159, 130	2, 950, 717	172, 027, 452	255, 104, 506
1930	159, 059, 334	228, 779, 756	1, 787, 016	2, 469, 531	160, 846, 350	231, 249, 287

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[1] Figures for production of masonry, natural, and puzzolan cements not available.

HYDRAULIC CEMENT PLANTS

Many requests for general information concerning the location of the plants manufacturing hydraulic cement have been received by the Bureau of Mines. To supply this information the following list has been prepared (as of September 30, 1931); the list is arranged alphabetically by States and location of plants, with the trade name of the cement as reported by the producer.

PORTLAND CEMENT

	Trade name
Alabama:	
Leeds—Universal Atlas Cement Co., Chicago, Ill.	Universal Atlas.
North Birmingham—	
Lehigh Portland Cement Co., Allentown, Pa.	Lehigh.
Lone Star Cement Co. Alabama, Birmingham	Lone Star.
Phoenixville—Alpha Portland Cement Co., Birmingham	Alpha and Phoenix.
Ragland—National Cement Co., Birmingham	Coosa.
Spocari—Lone Star Cement Co. Alabama, Birmingham	Incor.
Arkansas:	
Foreman—American Portland Cement Co., Little Rock, and New York, N. Y. (under construction in 1930)	------------------
Okay—Arkansas Portland Cement Co., Denver, Colo	OK.

	Trade name
California:	
Chubbuck—National Portland Cement Co., Dallas, Tex. (under construction in 1930)	Crystalite.
Colton—California Portland Cement Co., Los Angeles	Colton.
Cowell—Cowell Portland Cement Co., Cowell	Mt. Diablo.
Crestmore—Riverside Cement Co., Los Angeles	Plastic and Riverside.
Davenport—Santa Cruz Portland Cement Co., San Francisco	Santa Cruz.
Los Angeles—Blue Diamond Corporation (Ltd.), Los Angeles	Blue Diamond.
Merced—Yosemite Portland Cement Corporation, Merced	Yosemite.
Monolith—Monolith Portland Cement Co., Monolith	Monolith.
Oro Grande—Riverside Cement Co., Los Angeles	Riverside.
Redwood City—Pacific Portland Cement Co., San Francisco	Golden Gate and Old Mission.
San Andreas—Calaveras Cement Co., San Francisco	Calaveras and Calaveras Plastic Early Hardening.
San Juan Bautista—Pacific Portland Cement Co., San Francisco	Old Mission.
Victorville—Southwestern Portland Cement Co., Los Angeles	Victor.
Colorado:	
Boettcher—Colorado Portland Cement Co., Denver	Ideal.
Concrete—United States Portland Cement Co., Denver	Concrete.
Portland—Colorado Portland Cement Co., Denver	Ideal.
Florida: Hookers Point (near Tampa)—Florida Portland Cement Co., Tampa	Florida.
Georgia:	
Clinchfield—Pennsylvania-Dixie Cement Corporation, Chattanooga, Tenn	Clinchfield and Penn-Dixie.
Portland—Georgia Cement & Products Co., Birmingham, Ala	Piedmont.
Rockmart—Southern States Portland Cement Co., Rockmart	Southern States.
Idaho: Inkom—Idaho Portland Cement Co., Inkom	Eagle.
Illinois:	
Dixon—Medusa Portland Cement Co., Cleveland, Ohio	Medusa.
La Salle—	
Alpha Portland Cement Co., Easton, Pa	Alpha.
Marquette Cement Manufacturing Co., Chicago	Marquette and Super.
Oglesby—Lehigh Portland Cement Co., Allentown, Pa	Lehigh.
Indiana:	
Buffington—Universal Atlas Cement Co., Chicago, Ill	Universal Atlas.
Limedale—Lone Star Cement Co., Indiana (Inc.), Indianapolis	Incor and Lone Star.
Mitchell—Lehigh Portland Cement Co., Allentown, Pa	Lehigh.
Speed—Louisville Cement Co., Louisville, Ky. (also masonry and natural cements)	Speed.
Stroh—Wabash Portland Cement Co., Detroit, Mich	Wabash.

	Trade name
Iowa:	
Davenport—Dewey Portland Cement Co., Kansas City, Mo	Dewey.
Des Moines—Hawkeye Portland Cement Co., Des Moines	Hawkeye.
Gilmore City—Northwestern States Portland Cement Co., Mason City	Northwestern.
Mason City—	
Lehigh Portland Cement Co., Allentown, Pa	Lehigh.
Northwestern States Portland Cement Co., Mason City	Northwestern.
Valley Junction—Pennsylvania-Dixie Cement Corporation, Des Moines	Penn-Dixie.
Kansas:	
Bonner Springs—Lone Star Cement Co. (Kansas), Kansas City, Mo	Lone Star.
Chanute—Ash Grove Lime & Portland Cement Co., Kansas City, Mo	Ash Grove.
Fredonia—Consolidated Cement Corporation, Kansas City, Mo	Fredonia, Victor, and Samson Bricklayers.
Humboldt—Monarch Cement Co., Humboldt	Monarch.
Independence—Universal Atlas Cement Co., Chicago, Ill	Universal Atlas.
Iola—Lehigh Portland Cement Co., Allentown, Pa	Lehigh.
Mildred—Consolidated Cement Corporation, Kansas City, Mo	Victor.
Kentucky: Kosmosdale—Kosmos Portland Cement Co. (Inc.), Louisville (also masonry and natural cements)	Kosmos.
Louisiana: New Orleans—Lone Star Cement Co. Louisiana, New Orleans	Lone Star.
Maine: Thomaston—Lawrence Portland Cement Co., New York, N. Y	Dragon.
Maryland:	
Security—North American Cement Corporation, Hagerstown	Acme, Blue Band, Helderberg, and Security.
Union Bridge—Lehigh Portland Cement Co., Allentown, Pa	Lehigh.
Michigan:	
Alpena—Huron Portland Cement Co., Detroit	Huron.
Bay City—Aetna Portland Cement Co., Detroit	Aetna.
Bellevue—Alpha Portland Cement Co., Easton, Pa	Alpha.
Cement City—Consolidated Cement Corporation, Cement City	Peninsular.
Coldwater—Wolverine Portland Cement Co., Coldwater	Wolverine.
Dearborn—Ford Motor Co., Dearborn	Ford.
Detroit—Peerless Cement Corporation, Detroit	Peerless and Super.
Fenton—Aetna Portland Cement Co., Detroit	Aetna.
Four Mile Lake—Michigan State Cement Industry, Chelsea	Michigan State.
Newaygo—Medusa Portland Cement Co. (Newaygo Portland Cement Co.), Cleveland, Ohio	Newaygo.
Petoskey—Petoskey Portland Cement Co., Petoskey	Petoskey.
Port Huron—Peerless Cement Corporation, Detroit	Peerless and Super.
Quincy—Wolverine Portland Cement Co., Coldwater	Wolverine.
Wyandotte—Huron Portland Cement Co., Detroit	Wyandotte.
Minnesota: Duluth—Universal Atlas Cement Co., Chicago, Ill	Universal Atlas.

	Trade name
Missouri:	
Cape Girardeau—Marquette Cement Manufacturing Co., Chicago, Ill	Marquette and Super.
Hannibal—Universal Atlas Cement Co., Chicago, Ill	Universal Atlas.
Prospect Hill—Missouri Portland Cement Co., St. Louis	Prestolith Velo and Red Ring.
St. Louis—Alpha Portland Cement Co., Easton, Pa	Alpha.
Sugar Creek—Missouri Portland Cement Co., St. Louis	Red Ring.
Montana:	
Hanover—Three Forks Portland Cement Co., Denver, Colo	Red Devil.
Trident—Three Forks Portland Cement Co., Denver, Colo	Do.
Nebraska:	
Louisville—Ash Grove Lime & Portland Cement Co., Kansas City, Mo	Ash Grove.
Superior—Nebraska Cement Co., Denver, Colo	Ideal and Superior.
New Jersey:	
Stewartsville—Edison Cement Corporation, Orange	Edison.
Vulcanite—Vulcanite Portland Cement Co., Philadelphia, Pa	Vulcanite and Vulcanite Super.
New York:	
Alsen—	
Lehigh Portland Cement Co., Allentown, Pa	Lehigh.
North American Cement Corporation, Albany	Acme, Blue Band, Helderberg, and Security.
Buffalo—	
Federal Portland Cement Co., Youngstown, Ohio	Bessemer and Super.
Great Lakes Portland Cement Corporation, Buffalo	Lehigh.
Cementon—Alpha Portland Cement Co., Easton, Pa	Alpha.
Glens Falls—Glens Falls Portland Cement Co., Glens Falls	Iron Clad and Velo.
Howes Cave—North American Cement Corporation, Albany	Acme, Blue Band, Helderberg, and Security.
Hudson—	
Lone Star Cement Co., New York (Inc.), Albany	Lone Star.
Universal Atlas Cement Co., Chicago, Ill	Universal Atlas.
Jamesville—Alpha Portland Cement Co., Easton, Pa	Alpha.
Portland Point—Pennsylvania-Dixie Cement Corporation, Nazareth, Pa	Dexter, Penn-Dixie, and Pennsylvania.
Ohio:	
Baybridge—Medusa Portland Cement Co., Cleveland	Medusa.
Castalia—Castalia Portland Cement Co., Pittsburgh, Pa	Castalia.
Fairport—Standard Portland Cement Co., Painesville	Standard.
Fultonham—Pittsburgh Plate Glass Co., Zanesville	Columbia.
Ironton—Alpha Portland Cement Co., Easton, Pa	Alpha.
Middlebranch—Diamond Cement Co., Middlebranch	Diamond.
Osborn—	
Southwestern Portland Cement Co., Osborn	Akcello, Hydroplastic, and Miami.
Wabash Portland Cement Co., Detroit, Mich	Wabash.
Silica—Medusa Portland Cement Co., Cleveland	Medusa.
Superior—Wellston Iron Furnace Co., Jackson	Superior and Wifco.

	Trade name
Oklahoma:	
Ada—Oklahoma Portland Cement Co., Denver, Colo	OK.
Dewey—Dewey Portland Cement Co., Kansas City, Mo	Dewey.
Oregon:	
Gold Hill—Beaver Portland Cement Co., Portland	Beaver and Beaver Special.
Lime—Oregon Portland Cement Co., Portland	Sun.
Oswego—Oregon Portland Cement Co., Portland	Oregon.
Pennsylvania:	
Bath—	
Keystone Portland Cement Co., Philadelphia	Keystone.
Lehigh Portland Cement Co., Allentown	Lehigh.
Pennsylvania-Dixie Cement Corporation, Nazareth	Dexter, Penn-Dixie, and Pennsylvania.
Bessemer—Bessemer Limestone & Cement Co., Youngstown, Ohio	Bessemer and Super.
Cementon—Whitehall Cement Manufacturing Co., Philadelphia	Whitehall.
Conshohocken—Valley Forge Cement Co., Catasauqua	Allentown.
Coplay—Coplay Cement Manufacturing Co., Coplay	Saylors.
Egypt—Giant Portland Cement Co., Philadelphia	Giant.
Evansville—Allentown Portland Cement Co., Catasauqua	Allentown.
Fogelsville—Lehigh Portland Cement Co., Allentown	Lehigh.
Martins Creek—Alpha Portland Cement Co., Easton	Alpha and Alpha Mortar.
Nazareth—	
Lone Star Cement Co., Pennsylvania, Philadelphia	Incor and Lone Star.
Nazareth Cement Co., Nazareth	Nazareth.
Pennsylvania-Dixie Cement Corporation, Nazareth	Dexter, Penn-Dixie, and Pennsylvania.
Neville Island—Green Bag Cement Co., Pittsburgh	Green Bag.
New Castle—Lehigh Portland Cement Co., Allentown	Lehigh.
Northampton—Universal Atlas Cement Co., Chicago, Ill	Universal Atlas and Universal Atlas White.
Ormrod—Lehigh Portland Cement Co., Allentown	Lehigh.
Penn-Allen—Pennsylvania-Dixie Cement Corporation, Nazareth	Dexter, Penn-Dixie, and Pennsylvania.
Sandts Eddy—Lehigh Portland Cement Co., Allentown	Lehigh.
Siegfried—Lawrence Portland Cement Co., New York, N. Y. (also masonry and natural cements)	Dragon, Dragon Super, Special Mix, and Strongfast.
Stockertown—Hercules Cement Corporation, Philadelphia	Hercules.
Universal—Universal Atlas Cement Co., Chicago, Ill	Universal Atlas.
Wampum—Medusa Portland Cement Co. (Crescent Portland Cement Co.), Cleveland, Ohio	Crescent.
West Coplay—Lehigh Portland Cement Co., Allentown	Lehigh.
West Winfield—West Penn Cement Co., Butler	West Penn.
York—Medusa Portland Cement Co., Cleveland, Ohio	Medusa.

	Trade name
South Dakota: Rapid City—South Dakota Cement Plant, Rapid City	Dacotah.
Tennessee:	
Caswell—Volunteer Portland Cement Co., Knoxville	Volunteer.
Chattanooga—Signal Mountain Portland Cement Co., Chattanooga	Signal Mountain.
Cowan—Cumberland Portland Cement Co., Cowan	Cumberland.
Kingsport—Pennsylvania-Dixie Cement Corporation, Chattanooga	Clinchfield and Penn-Dixie.
Nashville—Hermitage Portland Cement Co., Nashville	Hermitage.
Richard City—Pennsylvania-Dixie Cement Corporation, Chattanooga	Clinchfield, Penn-Dixie, and Royal.
Texas:	
Cement—Lone Star Cement Co. Texas, Dallas	Lone Star.
Cementville—San Antonio Portland Cement Co., San Antonio	Alamo.
Eagle Ford—Trinity Portland Cement Co., Dallas	Trinity.
El Paso—Southwestern Portland Cement Co., El Paso	El Toro.
Fort Worth—Trinity Portland Cement Co., Dallas	Trinity.
Houston—Trinity Portland Cement Co., Dallas	Do.
Longhorn—Republic Portland Cement Co., San Antonio	Longhorn.
Manchester—Lone Star Cement Co. Texas, Dallas	Lone Star.
Waco—Universal Atlas Cement Co., Chicago, Ill	Universal Atlas
Utah:	
Bakers—Utah Idaho Cement Co., Brigham	Beehive.
Devils Slide—Union Portland Cement Co., Denver, Colo	Red Devil.
Salt Lake City—Portland Cement Co. of Utah, Salt Lake City	Utah.
Virginia:	
Fordwick—Lehigh Portland Cement Co., Allentown, Pa	Lehigh.
Norfolk—Lone Star Cement Co. Virginia (Inc.), Norfolk	Lone Star.
Washington:	
Bellingham—Olympic Portland Cement Co. (Ltd.), Seattle	Olympic and Velo.
Concrete—Superior Portland Cement (Inc.), Seattle	Superior and Superior Hyurly.
Grotto—Northwestern Portland Cement Co., Grotto	Northwestern.
Irvin—International Portland Cement Co. (Ltd.), Spokane	Spokane.
Metaline Falls—Lehigh Portland Cement Co., Allentown, Pa	Lehigh.
Seattle—Superior Portland Cement (Inc.), Seattle	Diamond and High-early-strength Double Diamond.
West Virginia:	
Kenova—Green Bag Cement Co., Pittsburgh, Pa	Green Bag.
Manheim—Alpha Portland Cement Co., Easton, Pa	Alpha.
Martinsburg—Standard Lime & Stone Co., Baltimore, Md	Capitol.
Wisconsin: Manitowoc—Medusa Portland Cement Co. (Manitowoc Portland Cement Co.), Cleveland, Ohio	Badger State.
Wyoming: Laramie—Monolith-Portland Midwest Co., Monolith, Calif	Monolith.

MASONRY AND NATURAL CEMENTS

	Trade name
Illinois: Utica—Utica Hydraulic Cement Co., Utica	Utica.
Indiana: Speed—Louisville Cement Co., Louisville, Ky. (also Portland cement)	Brixment and Star.
Kansas: Fort Scott—Fort Scott Hydraulic Cement Co., Fort Scott	Fort Scott Hydraulic.
Kentucky: Kosmosdale—Kosmos Portland Cement Co. (Inc.), Louisville (also Portland cement)	Kosmortar.
Minnesota:	
Austin—Austin Cement Works, Mankato	Austin Bricklayer.
Carney—Carney Co., Mankato	Carney.
Mankato—Carney Co., Mankato	Do.
New York:	
Brixment—Louisville Cement Co., Louisville, Ky.	Brixment.
Rosendale—Century Cement Corporation, Rosendale	Century.
Ohio: Lisbon (near)—Lisbon Cement Co., Lisbon	Lisbon Special Safe Cement.
Pennsylvania: Siegfried—Lawrence Portland Cement Co., New York, N. Y. (also Portland cement)	Hy-Test Mason's.
Virginia: Riverton Lime Co., Riverton	Flamingo.

PUZZOLAN CEMENT

Alabama:	
Graystone—Cheney Lime & Cement Co., Birmingham	Vesuvius.
North Birmingham—Southern Cement Co., Birmingham	Magnolia.

ALUMINA CEMENT

Missouri: Hannibal—Atlas Lumnite Cement Co., Chicago, Ill	Atlas Lumnite.
Pennsylvania: Northampton—Atlas Lumnite Cement Co., Chicago, Ill	Do.

PORTLAND CEMENT

PRODUCTION, SHIPMENTS, AND STOCKS

Of the 35 States in which Portland cement was manufactured in both 1929 and 1930, 13 showed increases in production and 15 increases in shipments in 1930 as compared with 1929. All the commercial districts, except eastern Missouri-Iowa-Minnesota-South Dakota, western Missouri-Nebraska-Kansas-Oklahoma-Arkansas, and Oregon-Washington showed decreased production, and all except the first and last named showed decreased shipments; the decreases in production ranged from 0.7 to 23 per cent and those in shipments from 3 to 19 per cent. The net change for the country as a whole was a decrease of 6 per cent in both production and shipments.

The output of 161,197,228 barrels of 376 pounds net is equivalent to 644,788,912 sacks, 27,058,106 long tons, or 30,305,079 short tons. In 1930 production exceeded shipments by 2,137,894 barrels.

In the following table the statistics are arranged by States, so far as permissible, and by districts. The term "active plant" is applied to a mill or group of mills situated at one place and operated by one company. If a company has establishments at different places its mill or group of mills at each place is counted as a plant. The districts are groups of States geographically and commercially related.

Portland cement produced, shipped, and in stock in the United States, 1929 and 1930, by States and districts

	Active plants		Production			Shipments							Stock (Dec. 31)		
			Barrels		Increase or decrease, 1930 (per cent)	1929		1930		Average factory value per barrel		Increase or decrease in quantity, 1930 (per cent)	Barrels		Increase or decrease, 1930 (per cent)
	1929	1930	1929	1930		Barrels	Value	Barrels	Value	1929	1930		1929 (revised)	1930	
STATE															
Alabama	6	6	5, 005, 967	4, 821, 141	−4	5, 228, 947	$5, 911, 031	4, 689, 516	$5, 829, 818	$1. 13	$1. 24	−10	522, 058	653, 683	+25
California	12	12	13, 091, 899	10, 124, 219	−23	12, 964, 746	22, 805, 576	10, 438, 479	15, 241, 089	1. 76	1. 46	−19	1, 077, 385	763, 125	−29
Illinois	4	4	8, 242, 725	7, 934, 563	−4	7, 738, 208	11, 134, 538	7, 951, 680	10, 519, 162	1. 44	1. 32	+3	1, 201, 958	1, 184, 841	−1
Iowa	6	6	6, 373, 330	7, 088, 108	+11	6, 586, 111	9, 781, 159	7, 035, 252	10, 107, 584	1. 49	1. 44	+7	1, 347, 144	1, 400, 000	+4
Kansas	7	7	6, 739, 741	6, 012, 360	−11	6, 855, 861	10, 041, 282	5, 633, 098	8, 254, 416	1. 46	1. 47	−18	795, 512	1, 174, 774	+48
Michigan	14	14	13, 748, 862	11, 510, 895	−16	13, 325, 727	18, 916, 711	10, 817, 994	14, 897, 439	1. 42	1. 38	−19	2, 403, 185	3, 096, 086	+29
Missouri	5	5	8, 113, 304	7, 808, 543	−4	7, 984, 337	11, 557, 905	8, 030, 528	11, 470, 751	1. 45	1. 43	+. 6	1, 025, 837	803, 852	−22
New York	10	10	10, 761, 368	10, 372, 742	−4	10, 742, 992	15, 597, 868	10, 256, 086	15, 380, 703	1. 45	1. 50	−5	1, 523, 266	1, 639, 922	+8
Ohio	10	10	9, 427, 084	8, 632, 062	−8	9, 144, 085	13, 427, 778	8, 185, 077	11, 956, 038	1. 47	1. 46	−10	1, 357, 074	1, 804, 059	+33
Pennsylvania	27	27	39, 354, 470	37, 843, 662	−4	39, 309, 662	55, 600, 953	37, 968, 647	52, 712, 176	1. 41	1. 39	−3	6, 010, 685	5, 885, 700	−2
Tennessee	6	6	4, 442, 249	3, 874, 549	−13	4, 537, 601	5, 576, 235	3, 822, 598	5, 315, 693	1. 23	1. 39	−16	475, 566	527, 517	+11
Texas	9	9	7, 374, 428	6, 781, 502	−8	7, 083, 572	11, 805, 779	6, 792, 346	10, 782, 444	1. 67	1. 59	−4	812, 771	801, 927	−1
Other States [1]	47	47	37, 970, 609	38, 392, 882	+1	38, 366, 473	59, 996, 974	37, 438, 033	56, 312, 443	1. 56	1. 50	−2	5, 148, 092	6, 102, 941	+19
	163	163	170, 646, 036	161, 197, 228	−6	169, 868, 322	252, 153, 789	159, 059, 334	228, 779, 756	1. 48	1. 44	−6	23, 700, 533	25, 838, 427	+9
DISTRICT															
Eastern Pennsylvania, New Jersey, and Maryland	25	25	37, 726, 967	35, 140, 880	−7	37, 647, 014	53, 042, 469	35, 356, 917	49, 041, 368	1. 41	1. 39	−6	5, 251, 826	5, 035, 789	−4
New York and Maine	11	11	11, 418, 596	11, 341, 724	−. 7	11, 519, 619	16, 780, 423	11, 121, 958	16, 877, 560	1. 46	1. 52	−3	1, 554, 615	1, 774, 381	+14
Ohio, Western Pennsylvania, and West Virginia	19	19	17, 936, 179	17, 620, 488	−2	17, 737, 226	25, 922, 200	17, 068, 119	24, 395, 914	1. 46	1. 43	−4	3, 034, 638	3, 587, 007	+18
Michigan	14	14	13, 748, 862	11, 510, 895	−16	13, 325, 727	18, 916, 711	10, 817, 994	14, 897, 439	1. 42	1. 38	−19	2, 403, 185	3, 096, 086	+29
Wisconsin, Illinois, Indiana, and Kentucky	11	11	21, 378, 418	20, 232, 671	−5	21, 171, 227	31, 168, 394	19, 571, 759	26, 995, 982	1. 47	1. 38	−8	2, 942, 727	3, 603, 639	+22

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[1] Includes Arkansas, Colorado, Florida, Georgia, Idaho, Indiana, Kentucky, Louisiana, Maine, Maryland, Minnesota, Montana, Nebraska, New Jersey, Oklahoma, Oregon, South Dakota, Utah, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

Portland cement produced, shipped, and in stock in the United States, 1929 and 1930, by States and districts—Continued

	Active plants		Production			Shipments							Stock (Dec. 31)		
			Barrels		Increase or decrease, 1930 (per cent)	1929		1930		Average factory value per barrel		Increase or decrease in quantity, 1930 (per cent)	Barrels		Increase or decrease, 1930 (per cent)
	1929	1930	1929	1930		Barrels	Value	Barrels	Value	1929	1930		1929 (revised)	1930	
DISTRICT—continued															
Virginia, Tennessee, Alabama, Georgia, Florida, and Louisiana	19	19	13, 792, 618	12, 880, 818	−7	14, 047, 259	$17, 689, 012	12, 728, 652	$17, 664, 733	$1. 26	$1. 39	−9	1, 642, 359	1, 794, 525	+9
Eastern Missouri, Iowa, Minnesota, and South Dakota	12	12	15, 697, 414	16, 693, 905	+6	15, 984, 176	23, 430, 891	16, 886, 039	24, 061, 001	1. 47	1. 42	+6	2, 595, 251	2, 403, 117	−7
Western Missouri, Nebraska, Kansas, Oklahoma, and Arkansas	13	13	12, 392, 722	12, 510, 599	+1	12, 267, 352	18, 124, 275	11, 880, 424	17, 704, 859	1. 48	1. 49	−3	1, 459, 130	2, 089, 305	+43
Texas	9	9	7, 374, 428	6, 781, 502	−8	7, 083, 572	11, 805, 779	6, 792, 346	10, 782, 444	1. 67	1. 59	−4	812, 771	801, 927	−1
Colorado, Montana, Utah, Wyoming, and Idaho	9	9	2, 695, 024	2, 268, 813	−16	2, 766, 167	5, 764, 757	2, 375, 335	4, 657, 623	2. 08	1. 96	−14	459, 822	353, 300	−23
California	12	12	13, 091, 899	10, 124, 219	−23	12, 964, 746	22, 805, 576	10, 438, 479	15, 241, 089	1. 76	1. 46	−19	1, 077, 385	763, 125	−29
Oregon and Washington	9	9	3, 392, 909	4, 090, 714	+21	3, 354, 237	6, 703, 302	4, 021, 312	6, 459, 744	2. 00	1. 61	+20	466, 824	536, 226	+15
	163	163	170, 646, 036	161, 197, 228	−6	169, 868, 322	252, 153, 789	159, 059, 334	228, 779, 756	1. 48	1. 44	−6	23, 700, 533	25, 838, 427	+9

The following table, which shows production, shipments, and stocks of finished Portland cement by districts and by months for 1930, has been compiled from monthly reports on the operation of all but four plants in May, three in June and July, and two in the other months of the year; estimates have been included for these plants. The table also shows totals for the United States for 1929 compiled from reports from all but two plants each month; estimates have been included for the latter. Although the figures only approximate the totals shown by other tables, which are based on final annual reports from the producers, they reflect accurately the fluctuations in the industry during the year. In December, January, and February, in the colder part of the United States, the production of Portland cement is necessarily somewhat curtailed by the weather, as are also demand and hence shipments from the mills. Moreover, mills often close for repairs during the winter when the demand is lowest. As the quantity of clinker or unground cement produced and in reserve at the mills awaiting manufacture into finished cement is of interest, the table appended shows these statistics, compiled from estimates by the manufacturers.

Summary of monthly estimates of Portland cement produced, shipped, and in stock at mills in the United States in 1930, by districts, in thousands of barrels

District	January	February	March	April	May	June	July	August	September	October	November	December
PRODUCTION												
Eastern Pennsylvania, New Jersey, and Maryland	2,286	2,033	2,717	3,067	3,707	3,397	3,566	3,676	3.273	2,793	2,390	1,939
New York and Maine	320	187	618	999	1,176	1,271	1,249	1,396	1,238	1,220	924	716
Ohio, western Pennsylvania, and West Virginia	727	762	1,205	1,458	2,112	1,924	1,973	2,009	1,873	1,655	1,085	769
Michigan	346	543	383	562	1,419	1,487	1,410	1,426	1,242	1,130	943	614
Wisconsin, Illinois, Indiana, and Kentucky	1,377	883	1,129	1,366	2,143	2,336	2,255	2,409	2,171	1,938	1,233	984
Virginia, Tennessee, Alabama, Georgia, Florida, and Louisiana	842	727	1,099	1,262	1,306	1,316	1.213	1,232	1,198	1,132	877	680
Eastern Missouri, Iowa, Minnesota, and South Dakota	758	748	971	1,415	1,763	1,987	1,832	1,933	1,748	1,591	1,131	906
Western Missouri, Nebraska, Kansas, Oklahoma, and Arkansas	701	709	945	1,160	1,360	1,322	1,405	1,361	1,233	957	743	700
Texas	321	482	694	757	630	558	585	697	679	484	502	392
Colorado, Montana, Utah, Wyoming, and Idaho	---------	130	240	286	314	300	217	302	260	134	40	34
California	718	755	873	838	926	955	1,009	922	806	953	817	531
Oregon and Washington	102	203	351	351	393	386	364	458	403	423	413	215
United States, 1930	8,498	8,162	11,225	13,521	17,249	17,239	17,078	17,821	16,124	14,410	11,098	8,480
1929	9,881	8,522	9,969	13,750	16,151	16,803	17,315	18,585	17,223	16,731	14,053	11,215
SHIPMENTS												
Eastern Pennsylvania, New Jersey, and Maryland	1,388	1,419	2,311	3,127	3,746	3,903	4,085	4,161	3,813	3,535	2,124	1,469
New York and Maine	249	257	472	839	1,191	1,381	1,524	1,560	1,467	1,201	617	364
Ohio, western Pennsylvania, and West Virginia	472	651	724	1,375	1,974	2,119	2,358	2,338	1,984	1,704	830	467
Michigan	234	297	411	702	1,229	1,459	1,604	1,627	1,381	1,093	538	245
Wisconsin, Illinois, Indiana, and Kentucky	327	664	696	1,265	2,026	2,552	2,916	3,045	2,716	2,115	857	394
Virginia, Tennessee, Alabama, Georgia, Florida, and Louisiana	730	881	970	1,239	1,192	1,180	1,327	1,328	1,178	1,248	807	648
Eastern Missouri, Iowa, Minnesota, and South Dakota	214	492	502	1,230	2,184	2,412	2,540	2,491	2,116	1,618	739	337
Western Missouri, Nebraska, Kansas, Oklahoma, and Arkansas	271	764	838	1,264	1,390	1,404	1,442	1,412	1,227	947	632	367
Texas	317	521	627	776	620	706	709	634	599	469	453	362
Colorado, Montana, Utah, Wyoming, and Idaho	42	104	163	262	290	296	276	292	258	227	118	46
California	640	793	816	921	980	951	946	961	905	1,006	728	755
Oregon and Washington	71	169	296	340	402	418	426	450	439	436	341	234
United States, 1930	4,955	7,012	8,826	13,340	17,224	18,781	20,153	20,299	18,083	15,599	8,784	5,688
1929	5,707	5,448	10,113	13,325	16,706	18,949	20,319	23,052	19,950	18,695	11,222	5,951

STOCKS (END OF MONTH)												
Eastern Pennsylvania, New Jersey, and Maryland	6,075	6,689	7,095	7,037	6,998	6,513	5,992	5,509	4,966	4,255	4,521	5,036
New York and Maine	1,615	1,556	1,702	1,862	1,847	1,737	1,462	1,298	1,069	1,088	1,395	1,774
Ohio, western Pennsylvania, and West Virginia	3,289	3,401	3,882	3,965	4,102	3,908	3,523	3,190	3,079	3,030	3,285	3,587
Michigan	2,509	2,761	2,734	2,595	2,785	2,812	2.618	2,418	2,279	2,317	2,722	3,096
Wisconsin, Illinois, Indiana, and Kentucky	3,926	4,145	4,578	4,691	4,808	4,591	3,931	3,295	2,751	2,546	2,922	3,604
Virginia, Tennessee, Alabama, Georgia, Florida, and Louisiana	1,753	1,598	1,728	1,751	1,865	2,001	1,889	1,794	1,814	1,697	1,767	1,795
Eastern Missouri, Iowa, Minnesota, and South Dakota	3,140	3,396	3,864	4,049	3,628	3,203	2,495	1,937	1,569	1,542	1,934	2,403
Western Missouri, Nebraska, Kansas, Oklahoma, and Arkansas	1,889	1,834	1,941	1,837	1,807	1,725	1,688	1,637	1,643	1,652	1,763	2,089
Texas	817	778	845	825	836	688	564	627	707	721	769	802
Colorado, Montana, Utah, Wyoming, and Idaho	415	441	518	540	563	562	501	509	508	414	335	353
California	1,168	1,131	1,187	1,130	1,077	1,080	1,144	1,105	1,020	963	1,100	763
Oregon and Washington	485	519	574	585	575	544	482	505	484	472	543	536
United States, 1930	27,081	28,249	30,648	30,867	30,891	29,364	26,289	23,824	21,889	20,697	23,056	25,838
1929	26,797	29,870	29,724	30,151	29,624	27,505	24,525	20,056	17,325	15,381	18,213	[1] 23,701

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[1] Revised figures.

Summary of monthly estimates of clinker (unground Portland cement) produced and in stock at mills in the United States in 1930, by districts in thousands of barrels

District	January	February	March	April	May	June	July	August	September	October	November	December	Year
PRODUCTION													
Eastern Pennsylvania, New Jersey, and Maryland	2,546	2,415	3,120	3,264	3,543	3,270	3,211	3,273	2,919	2,470	2,235	2,052	34,318
New York and Maine	525	344	627	1,081	1,067	1,123	1,124	1,136	1,180	1,183	1,030	817	11,237
Ohio, western Pennsylvania, and West Virginia	999	1,041	1,341	1,640	1,988	1,854	1,667	1,511	1,622	1,525	1,263	992	17,443
Michigan	868	758	716	907	1,204	1,241	1,138	1,092	1,006	1,141	917	690	11,678
Wisconsin, Illinois, Indiana, and Kentucky	1,586	1,539	1,626	1,829	2,197	2,099	1,854	1,858	1,665	1,706	1,337	1,109	20,405
Virginia, Tennessee, Alabama, Georgia, Florida, and Louisiana	901	758	1,195	1,335	1,403	1,222	1,152	1,220	1,197	1,088	972	745	13,188
Eastern Missouri, Iowa, Minnesota, and South Dakota	790	893	1,255	1,547	1,802	1,776	1,606	1,608	1,627	1,590	1,092	950	16,536
Western Missouri, Nebraska, Kansas, Oklahoma, and Arkansas	805	796	1,031	1,199	1,272	1,282	1,330	1,279	1,194	992	885	807	12,872
Texas	400	451	656	643	596	485	550	701	653	522	498	393	6,548
Colorado, Montana, Utah, Wyoming, and Idaho	11	135	207	234	313	321	241	342	291	160	29	--------	2,284
California	926	701	877	946	858	899	891	860	861	1,091	1,002	607	10,519
Oregon and Washington	147	177	394	400	364	323	305	364	362	427	379	322	3,964
United States, 1930	10,504	10,008	13,045	15,025	16,607	15,895	15,069	15,244	14,577	13,895	11,639	9,484	160,992
1929	12,012	11,255	12,450	14,166	15,444	15,312	15,214	15,829	15,165	15,515	14,087	12,539	168,988
STOCKS (END OF MONTH)													
Eastern Pennsylvania, New Jersey, and Maryland	1,356	1,785	2,223	2,461	2,340	2,259	1,962	1,610	1,292	1,025	917	1,045	--------
New York and Maine	813	970	987	1,081	986	849	740	496	453	430	547	659	--------
Ohio, western Pennsylvania, and West Virginia	1,212	1,496	1,643	1,845	1,749	1,705	1,432	972	752	648	834	1,064	--------
Michigan	1,152	1,371	1,705	2,053	1,847	1,613	1,351	1,027	800	819	793	871	--------
Wisconsin, Illinois, Indiana, and Kentucky	858	1,511	2,011	2,482	2,544	2,316	1,922	1,380	878	649	755	887	--------
Virginia, Tennessee, Alabama, Georgia, Florida, and Louisiana	732	770	879	964	1,074	980	928	917	925	876	964	1,028	--------
Eastern Missouri, Iowa, Minnesota, and South Dakota	575	728	1,018	1,158	1,221	1,037	836	587	490	500	475	530	--------
Western Missouri, Nebraska, Kansas, Oklahoma, and Arkansas	290	383	475	519	446	417	354	285	258	301	447	556	--------
Texas	563	536	507	404	379	315	286	299	279	328	331	338	--------
Colorado, Montana, Utah, Wyoming, and Idaho	254	258	235	183	184	206	229	270	302	329	305	271	--------
California	1,315	1,261	1,268	1,406	1,315	1,231	1,109	1,004	961	1,025	1,081	1,140	--------
Oregon and Washington	526	503	552	608	583	524	535	428	393	336	309	420	--------
United States, 1930	9,646	11,572	13,503	15,164	14,668	13,452	11,684	9,275	7,783	7,266	7,758	8,809	--------
1929	9,642	12,436	14,948	15,479	14,911	13,587	11,619	8,995	7,009	5,934	6,134	7,526	--------

Except in February, when the increase in shipments was reflected by a corresponding decrease in stocks, producers' stocks of Portland cement reported on hand at the mills increased each month in 1930 in comparison with the corresponding month in 1929. Reserves at the end of 1930 were 9 per cent higher than those at the end of 1929, exceeded the average for the five preceding years (21,598,876 barrels) by more than 19 per cent, and represented the largest stocks on hand at the end of any year since official statistics of this item have been recorded. The totals by States and districts are given in the preceding tables.

Producers' stocks of finished Portland cement on hand at mills in the United States, December 31, 1921–1930, in barrels

1921	12, 192, 657	1926	20, 740, 187
1922	9, 352, 250	1927	22, 457, 382
1923	10, 812, 639	1928	22, 760, 103
1924	14, 151, 695	1929	[2] 23, 700, 533
1925	18, 336, 173	1930	25, 838, 427

DOMESTIC CONSUMPTION

The total consumption of Portland cement in the United States may be estimated by adding the imports to the shipments and subtracting the exports from the sum. Of course, at any time a variable but considerable quantity of cement is in transit, in warehouses at distributing points, and awaiting use at jobs, so that the estimate thus made is at best only approximate. Another fact that impairs the accuracy of the estimate is that the cement imported and exported is classed as hydraulic cement; hence, the records do not discriminate between Portland and other cements and probably include some plaster also. Portland cement, however, constitutes by far the greater part of the exports. The apparent domestic consumption in 1930 decreased nearly 7 per cent as compared with 1929. This decrease and that of nearly 4 per cent in 1929 as compared with 1928 are the only decreases in apparent domestic consumption recorded since 1918.

Portland cement available for consumption in the United States, 1921–1930, in barrels

Year	Shipments	Imports	Exports	Available for consumption
1921	95, 507, 147	122, 322	1, 181, 014	94, 448, 455
1922	117, 701, 216	323, 823	1, 127, 845	116, 897, 194
1923	135, 912, 118	1, 678, 636	1, 001, 688	136, 589, 066
1924	146, 047, 549	2, 010, 936	878, 543	147, 179, 942
1925	157, 295, 212	3, 655, 317	1, 019, 597	159, 930, 932
1926	162, 187, 090	3, 232, 386	974, 326	164, 445, 150
1927	171, 864, 728	2, 050, 180	816, 726	173, 098, 182
1928	175, 838, 332	2, 284, 085	824, 656	177, 297, 761
1929	169, 868, 322	1, 727, 900	885, 321	170, 710, 901
1930	159, 059, 334	975, 546	755, 778	159, 279, 102

The only available gage of consumption of Portland cement by States is the record of shipments into the several States by the manufacturers and is therefore merely approximate. The shipments of cement into a State during a year do not equal the consumption in that State during the same year, but shipments over a long period should afford a fair index of consumption. The simplest available common unit is the estimated consumption in barrels per capita, which is obtained by comparing the shipments into the several States with the population of those States. The following table shows such figures for 1929 and 1930. The estimates of population used in calculating the per capita consumption are those of the Bureau of the Census.

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[2] Revised figures.

The official figures for exports of cement on page 431 differ from the exports reported by manufacturers in the following table, because cement forwarded from mills and destined for foreign countries and for Alaska, Hawaii, and Porto Rico is reported by the shipper as exported, whether or not it leaves the country during the calendar year, whereas the Bureau of Foreign and Domestic Commerce export figures record the cement that actually leaves the country during the period specified. (Shipments to Alaska, Hawaii, and Porto Rico appear on p. 431.) The exports for 1930 recorded by that bureau include all other hydraulic cement exported, whereas the table of per capita consumption relates only to Portland cement.

The per capita consumption indicated by the table necessarily falls short of the total apparent consumption by the quantity of the imports. These increase the consumption in certain States near the Canadian border and the seaboard; in 1930 they increased the general average per capita consumption about 0.008 barrel.

In 29 States—16 east and 13 west of the Mississippi River—the per capita consumption in 1930 was 1 barrel or more. Two Southern States—Louisiana and Texas—are included in this class.

The highest per capita consumption in 1930 was that of Iowa—2.59 barrels; only this State and the District of Columbia showed a per capita consumption of more than 2 barrels. As compared with 1929 Louisiana showed the largest increase in per capita consumption, followed by Washington, Iowa, South Carolina, Maine, Minnesota, and Idaho, in the order named.

Changes in per capita consumption occurred in all the States in 1930 in comparison with the preceding year. Increases were recorded in 20 States and in the District of Columbia; decreases were recorded in 28 States. The decreases in per capita consumption in 1930 ranged from 0.01 to 1.02 barrels; the increases from 0.01 to 0.53 barrel. The general average per capita consumption for the United States was 1.29 barrels in 1930 as compared with 1.41 barrels in 1929. During the period 1914 to 1930 the average per capita consumption for the country has ranged from a low of 0.64 barrel (in 1918) to a high of 1.46 barrels (in 1928).

Shipments of domestic Portland cement from mills into States and per capita, 1929 and 1930, in barrels [1]

State	1929		1930	
	Total	Per capita [1]	Total	Per capita [1]
Alabama	1,958,089	0.76	1,273,632	0.48
Arizona [2]	656,775	1.39	462,560	1.06
Arkansas	1,555,517	.80	1,459,388	.79
California	11,802,278	2.59	9,426,837	1.66
Colorado	891,973	.82	843,983	.81
Connecticut [2]	1,908,868	1.15	1,754,324	1.09
Delaware [2]	365,257	1.50	373,672	1.57
District of Columbia [2]	1,126,946	2.04	1,078,729	2.22
Florida	1,176,495	.83	1,056,549	.72
Georgia	1,423,359	.44	1,561,775	.54
Idaho	261,378	.48	311,800	.70
Illinois	13,490,520	1.82	11,164,248	1.46
Indiana	5,674,739	1.79	4,927,894	1.52
Iowa	5,462,534	2.25	6,411,595	2.59
Kansas	2,605,330	1.42	2,398,123	1.27
Kentucky	1,575,715	.62	1,695,202	.65
Louisiana	1,657,154	.85	2,892,404	1.38
Maine	600,423	.76	835,795	1.05
Maryland	2,426,107	1.50	2,555,386	1.57
Massachusetts [2]	2,908,230	.68	3,090,962	.73
Michigan	11,686,635	2.55	8,625,691	1.78
Minnesota	3,212,554	1.18	3,668,645	1.43
Mississippi [2]	1,028,561	.57	619,649	.31
Missouri	5,620,624	1.60	6,145,380	1.69
Montana	552,357	1.01	319,214	.59
Nebraska	1,470,294	1.04	1,675,904	1.22
Nevada [2]	133,132	1.72	147,243	1.62
New Hampshire [2]	665,519	1.46	559,958	1.20
New Jersey	8,015,348	2.10	6,536,136	1.62
New Mexico [2]	286,473	.72	298,111	.70
New York	21,039,518	1.82	20,147,426	1.60
North Carolina [2]	1,753,324	.60	1,165,162	.37
North Dakota [2]	444,798	.69	337,888	.50
Ohio	10,033,158	1.47	9,698,510	1.46
Oklahoma	3,352,328	1.38	3,396,549	1.42
Oregon	1,017,434	1.13	1,070,341	1.12
Pennsylvania	13,135,444	1.33	13,795,600	1.43
Rhode Island [2]	721,352	1.01	704,943	1.03
South Carolina [2]	1,190,008	.64	1,654,951	.95
South Dakota	530,455	.75	540,867	.78
Tennessee	2,934,953	1.17	2,410,519	.92
Texas	7,584,278	1.38	6,417,951	1.10
Utah	521,047	.98	417,472	.82
Vermont [2]	928,881	2.64	582,495	1.62
Virginia	1,764,760	.69	1,648,052	.68
Washington	2,477,520	1.56	3,102,088	1.98
West Virginia	1,415,161	.82	1,598,843	.92
Wisconsin	5,517,598	1.87	4,974,591	1.69
Wyoming	192,995	.78	178,873	.79
Unspecified			15,865	
	168,754,196	1.41	158,029,775	1.29
Exports reported by manufacturers but not included above [3]	1,114,126		1,029,559	
Total shipped from cement plants	169,868,322		159,059,334	

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[1] Per capita figures based on latest available estimates of population made by the Bureau of the Census.

[2] Noncement-producing State.

[3] Includes shipments to Alaska, Hawaii, and Porto Rico.

The following table, which shows the monthly shipments from Portland-cement mills into States in 1930, has been compiled from monthly reports of producers but includes estimates of the distribution of shipments from two plants each month. Although the figures vary slightly from the totals shown in the other tables, which are based on final annual reports from the producers, they reflect the fluctuations in shipments during the year.

Portland cement shipped from mills into States in 1930, by months, in barrels [1]

Shipped to—	January	February	March	April	May	June
Alabama	106,309	135,425	104,750	126,501	129,594	124,375
Alaska	1,590	132	864	2,988	2,068	2,961
Arizona	49,286	35,218	44,917	45,312	41,429	41,057
Arkansas	43,629	80,512	86,481	130,247	131,701	175,644
California	560,052	695,831	718,840	823,295	876,467	843,231
Colorado	14,818	43,570	57,317	85,644	109,098	110,203
Connecticut	63,245	60,197	109,085	184,816	211,543	191,348
Delaware	12,810	16,100	19,467	32,573	38,168	59,042
District of Columbia	44,747	48,482	70,893	82,913	96,091	80,561
Florida	91,344	82,931	87,400	104,898	104,418	89,285
Georgia	87,956	90,938	101,858	139,155	135,715	142,722
Hawaii	27,413	25,734	22,829	26,240	29,558	15,182
Idaho	2,585	9,943	18,305	25,650	22,081	31,356
Illinois	182,347	356,200	379,453	694,367	1,038,904	1,212,319
Indiana	94,596	189,599	201,551	386,945	637,605	820,836
Iowa	34,357	111,155	117,907	447,570	1,067,232	1,126,961
Kansas	45,558	191,412	178,877	283,917	270,178	245,344
Kentucky	32,854	74,974	72,496	118,156	122,507	115,398
Louisiana	175,009	285,398	285,435	374,620	311,868	306,306
Maine	14,125	14,370	33,975	64,470	79,871	89,475
Maryland	80,253	101,896	172,822	257,033	331,582	267,222
Massachusetts	104,522	89,617	191,190	320,443	325,910	286,925
Michigan	203,440	258,450	344,412	599,371	1,022,121	1,164,439
Minnesota	59,107	111,059	91,055	248,088	501,896	627,906
Mississippi	52,518	48,264	56,606	42,812	44,775	51,847
Missouri	76,507	244,403	264,930	529,829	734,806	727,279
Montana	6,175	12,497	18,316	37,562	37,558	42,565
Nebraska	22,811	71,051	83,042	153,348	164,983	235,023
Nevada	5,452	8,306	11,923	15,637	15,133	16,830
New Hampshire	9,598	9,612	19,963	45,594	66,250	75,978
New Jersey	257,563	252,624	456,109	623,867	712,665	763,411
New Mexico	10,758	16,490	23,641	35,730	32,693	30,382
New York	681,645	663,031	1,095,878	1,556,095	2,032,025	2,331,986
North Carolina	64,998	75,768	101,751	141,565	133,974	111,543
North Dakota	2,787	10,070	20,791	39,253	43,316	63,127
Ohio	243,570	403,404	425,559	823,451	1,091,994	1,119,351
Oklahoma	99,486	234,569	283,365	381,939	364,053	353,241
Oregon	25,776	67,025	101,258	72,861	89,175	99,177
Pennsylvania	442,728	488,412	700,482	1,088,646	1,559,467	1,793,487
Porto Rico	1,750	1,750	2,125	1,300	5,265	250
Rhode Island	22,295	18,256	45,477	73,396	87,710	75,394
South Carolina	44,806	49,865	62,241	81,105	80,910	83,713
South Dakota	11,204	31,133	28,448	36,414	51,745	73,344
Tennessee	85,912	110,578	143,103	236,120	229,121	284,045
Texas	299,248	508,921	618,703	713,051	583,004	630,469
Utah	12,529	21,954	40,937	53,292	54,023	47,830
Vermont	21,257	14,964	23,132	32,457	55,676	72,329
Virginia	71,683	97,003	120,043	148,622	182,283	156,599
Washington	47,785	124,926	214,098	276,475	324,551	347,994
West Virginia	48,025	62,589	75,381	120,687	175,547	174,962
Wisconsin	77,039	140,053	159,096	299,210	564,324	751,985
Wyoming	2,755	6,225	9,934	15,870	18,818	25,877
Unspecified	8,760	17,732	40,274	14,500	13,660	5,268
	4,889,372	6,920,618	8,758,785	13,295,900	17,187,109	18,715,384
Foreign countries	65,628	91,382	67,215	44,100	36,891	65,616
Total shipped from cement plants	4,955,000	7,012,000	8,826,000	13,340,000	17,224,000	18,781,000

Shipped to—	July	August	September	October	November	December
Alabama	137,184	106,464	68,936	88,358	67,219	77,946
Alaska	1,774	4,465	1,362	697	158	142
Arizona	34,382	51,855	39,785	33,524	31,593	30,171
Arkansas	184,225	165,886	150,714	144,307	89,411	63,553
California	845,340	868,795	836,501	930,553	665,028	704,699
Colorado	92,898	106,576	82,050	78,683	41,748	19,474
Connecticut	191,178	205,553	195,962	153,822	113,957	68,997
Delaware	68,752	47,898	26,704	20,017	17,889	12,883
District of Columbia	87,492	126,581	137,507	154,670	84,931	59,861
Florida	105,993	85,673	76,333	89,354	74,271	60,233
Georgia	147,652	186,694	163,464	174,340	103,952	86,898
Hawaii	18,164	19,301	16,778	23,850	17,979	19,770
Idaho	51,059	52,084	46,308	34,385	13,538	4,829
Illinois	1,495,891	1,604,378	1,704,696	1,586,016	655,302	247,845
Indiana	864,425	686,122	497,163	321,285	160,458	80,190

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[1] Includes estimated distribution of shipments from 2 plants each month.

Portland cement shipped from mills into States in 1930, by months, in barrels—Continued

Shipped to—	July	August	September	October	November	December
Iowa	1,184,588	1,077,919	781,608	317,288	98,047	40,965
Kansas	226,827	271,491	250,548	226,472	153,458	78,186
Kentucky	223,147	265,288	241,402	223,805	102,299	54,631
Louisiana	308,306	235,564	163,544	172,194	133,845	130,600
Maine	95,005	128,866	148,381	87,454	53,127	26,759
Maryland	274,298	314,239	285,312	257,617	119,436	84,223
Massachusetts	324,874	328,187	331,061	376,533	248,481	153,583
Michigan	1,253,055	1,269,546	1,018,648	867,458	407,866	194,610
Minnesota	647,064	602,931	374,833	237,592	89,729	64,412
Mississippi	66,721	96,483	51,680	39,377	34,044	32,986
Missouri	737,463	770,346	710,759	713,573	413,025	188,762
Montana	37,429	36,407	44,217	27,189	20,597	9,612
Nebraska	210,545	226,618	241,572	174,005	68,717	21,890
Nevada	15,694	14,645	16,111	18,751	6,681	1,916
New Hampshire	80,647	81,651	84,449	48,117	24,958	12,673
New Jersey	788,857	709,844	610,200	664,381	403,664	259,936
New Mexico	31,722	36,680	28,870	27,047	17,445	12,929
New York	2,474,955	2,596,407	2,515,171	2,063,858	1,233,534	867,187
North Carolina	108,620	116,028	102,658	101,403	63,911	42,274
North Dakota	53,178	31,984	38,358	24,513	7,734	2,352
Ohio	1,294,504	1,286,700	1,103,327	1,011,292	614,013	238,538
Oklahoma	362,973	360,766	348,023	270,430	195,644	135,784
Oregon	116,047	114,400	112,133	130,953	87,098	53,936
Pennsylvania	1,915,236	1,912,983	1,557,564	1,351,511	517,568	431,241
Porto Rico	8,250	4,500	10,250	5,000	125	6,918
Rhode Island	66,903	83,057	100,664	76,031	34,865	20,270
South Carolina	185,517	236,649	245,776	273,208	177,632	132,992
South Dakota	82,598	72,829	86,654	44,410	17,948	7,187
Tennessee	267,623	285,916	294,910	271,922	117,871	74,077
Texas	644,850	605,660	73,392	438,457	454,199	339,964
Utah	38,485	44,554	39,116	38,549	21,142	4,271
Vermont	112,145	104,324	66,810	53,087	21,939	2,678
Virginia	182,631	179,227	174,179	155,410	102,029	77,370
Washington	330,911	341,647	328,595	324,276	262,159	185,135
West Virginia	199,923	216,018	196,307	139,483	105,304	56,245
Wisconsin	810,875	842,250	700,327	414,797	157,633	62,793
Wyoming	23,380	20,642	20,224	20,691	8,763	3,028
Unspecified		20,373	4,888	40,039	13,633	427
	20,112,255	20,261,944	18,046,784	15,562,034	8,747,597	5,650,831
Foreign countries	40,745	37,056	36,216	36,966	36,403	37,169
Total shipped from cement plants	20,153,000	20,299,000	18,083,000	15,599,000	8,784,000	5,688,000

LOCAL SUPPLIES

The following table compares the shipments from the mills within a State or group of States with the estimated consumption (State receipts of mill shipments) and indicates the surplus or deficiency in the supply of cement locally available. Consumption in the States that do not produce cement is also indicated in the table on page 415. Data for 1916 to 1928 will be found in Mineral Resources of the United States for 1917 to 1928.

The surplus shown in the following table was distributed by years, as follows: In 1929, to noncement-producing States, 14,118,124 barrels; to foreign countries and to Alaska, Hawaii, and Porto Rico, 1,114,126 barrels. In 1930, to noncement-producing States, 12,830,647 barrels; to foreign countries and to Alaska, Hawaii, and Porto Rico, 1,029,559 barrels; unspecified, 15,865 barrels. Of the surplus shipped to the 14 noncement-producing States, 63 per cent in 1929 and 68 per cent in 1930 was shipped to Massachusetts, Connecticut, North and South Carolina, and the District of Columbia.

Estimated surplus or deficiency in local supply of Portland cement in cement-producing States, 1929 and 1930, in barrels

State or division	1929			1930		
	Shipments from mills	Estimated consumption	Surplus or deficiency	Shipments from mills	Estimated consumption	Surplus or deficiency
Alabama	5, 228, 947	1, 958, 089	+3, 270, 858	4, 689, 516	1. 273, 632	+3, 415, 884
California	12, 964, 746	11, 802, 278	+1, 162, 468	10, 438, 479	9, 426, 837	+1, 011, 642
Illinois	7, 738, 208	13, 490, 520	−5, 752, 312	7, 951, 680	11, 164, 248	−3, 212, 568
Iowa	6, 586, 111	5, 462, 534	+1, 123, 577	7, 035, 252	6, 411, 595	+623, 657
Kansas	6, 855, 861	2. 605, 330	+4, 250, 531	5, 633, 098	2, 398, 123	+3, 234, 975
Michigan	13, 325, 727	11, 686, 635	+1, 639, 092	10, 817, 994	8, 625, 691	+2, 192, 303
Missouri	7, 984, 337	5, 620, 624	+2, 363, 713	8, 030, 528	6, 145. 380	+1, 885, 148
Ohio	9, 144, 085	10, 033, 158	−889, 073	8, 185, 077	9, 698, 510	−1, 513, 433
Pennsylvania	39, 309, 662	13, 135, 444	+26, 174, 218	37, 968, 647	13, 795, 600	+24, 173, 047
Tennessee	4, 537, 601	2, 934, 953	+1, 602, 648	3, 822, 598	2, 410, 519	+1, 412, 079
Texas	7, 083, 572	7, 584, 278	−500, 706	6, 792, 346	6, 417, 951	+374, 395
Colorado, Montana, Utah, Wyoming, and Idaho	2, 766, 167	2, 419, 750	+346, 417	2, 375, 335	2, 071, 342	+303, 993
Oregon and Washington	3, 354, 237	3, 494, 954	−140, 717	4, 021, 312	4, 172, 429	−151, 117
Georgia, Kentucky, Virginia, Florida, and Louisiana	4, 995, 767	7, 597, 483	−2, 601, 716	5, 111, 463	8, 853, 982	−3, 742, 519
Indiana, Wisconsin, Minnesota, Nebraska, Oklahoma, South Dakota, and Arkansas	19, 543, 182	21, 313, 485	−1, 770, 303	18, 792, 739	20, 643, 838	−1, [illegible], 099
Maryland, New Jersey, and West Virginia	6, 930, 493	11, 856, 616	−4, 926, 123	6, 271, 312	10, 690, 365	−4, 419, 053
New York and Maine	11, 519, 619	21, 639, 941	−10, 120, 322	11, 121, 958	20, 983, 221	−9, 861, 263
	169, 868, 322	154, 636, 072	+15, 232, 250	159, 059, 334	145, 183, 263	+13, 876, 071

PRICES

AT FACTORIES

The average selling value of Portland cement f. o. b. at the factories, with the price of containers not included and with cash discounts deducted where allowed, as reported to the Bureau of Mines is shown in the table of shipments by States and districts during 1929 and 1930 (p. 407). The averages by districts ranged from $1.38 a barrel in Michigan and in the Wisconsin-Illinois-Indiana-Kentucky district to $1.96 a barrel in the Colorado-Montana-Utah-Wyoming-Idaho district in 1930, as compared with a range from $1.26 a barrel in the Virginia-Tennessee-Alabama-Georgia-Florida-Louisiana district to $2.08 a barrel in the Colorado-Montana-Utah-Wyoming-Idaho district in 1929. The general average value for the country as a whole has decreased each year since 1923; it decreased 4 cents per barrel, or nearly 3 per cent, in 1930, as compared with 1929, and averages were lower in all of the districts except New York-Maine, Virginia-Tennessee-Alabama-Georgia-Florida-Louisiana, and western Missouri-Nebraska-Kansas-Oklahoma-Arkansas and in all the States shown in the table except Alabama, Kansas, New York, and Tennessee.

The average factory value of Portland cement may be higher for certain States than it would be if the ordinary structural cement were the only kind considered. For these States certain special cements that command higher prices are included in the average. These special cements include the white Portland cement made in Pennsylvania and, in 1927 and 1928, in Tennessee and the plastic and waterproofed Portland cements. The manufacture of white Portland cement in Tennessee was reported as discontinued in 1929. A plant in California, equipped for the manufacture of white cement, was under construction in 1930. The manufacture in California of cement characterized as plastic and waterproof and intended particularly for certain uses, such as shutting out water in oil wells, has been noted for some years in previous issues of this report. In 1927, the first year for which an attempt was made by the Bureau of Mines to collect separate statistics of special Portland cements, the manufacture and marketing of cement of marked plasticity and waterproofing qualities were reported in a number of other States. Statistics of output of high-early strength and plastic and waterproofed Portland cements as reported by the producers for 1929 and 1930 show increased use of these cements. (See table on p. 425.)

Average factory value per barrel in bulk of Portland cement, 1919–1930

1919	$1.71	1923	$1.90	1927	$1.62
1920	2.02	1924	1.81	1928	1.57
1921	1.89	1925	1.77	1929	1.48
1922	1.76	1926	1.71	1930	1.44

AT MARKETS

As the annual per capita consumption of Portland cement in the United States exceeds 1¼ barrels, the prices of such an essential building material have attracted particular interest. Considerable information is now available to show the position of cement prices among those of other structural materials and to explain the economic conditions that determine them. Data of interest in this connection are now compiled and published by the United States Department of Labor, Bureau of Labor Statistics.

Comparative prices of building materials in December, 1929 and 1930 [1]

[Percentage of increase or decrease from 1926 average]

	1929	1930
Building materials in general	−3.8	−15.6
Lime, building, at plant (composite price)	−12.1	−15.2
Plate glass, 3 to 5 feet, New York	−12.1	−17.1
Turpentine, New York	−42.6	−55.2
Brick, common, building, at plant (composite price)	−2.6	−9.4
Linseed oil, raw, New York	+32.0	−17.9
Douglas fir, No. 1, common, at mills	+2.2	−21.2
Yellow pine, flooring, at mills	−14.0	−27.9
Oak, plain white, No. 1, Cincinnati	−17.0	−24.3
Portland cement, at plant (composite price)	−10.8	−9.4

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[1] U. S. Department of Labor, Bureau of Labor Statistics, Wholesale Prices of Commodities: Report for December, 1930, pp. 9–10.

MANUFACTURING CONDITIONS

PLANTS

Portland cement was manufactured at 161 plants and shipments were made from 163 plants in 1930, as compared with 163 producing and shipping plants in 1929. Two plants that reported production in 1929 manufactured no cement in 1930; they shipped from stock on hand.

Three plants that were producing within the two years prior to 1929 reported no production or shipments in that year or in 1930; one of these plants was reported out of business in 1930.

Additional plants were reported as under construction but not completed in Arkansas and California.

FUELS [3]

In comparison with 1929, the percentage of cement burned by coal alone and that burned by oil decreased in 1930 and the percentage burned by natural gas increased. Of the Portland cement produced in 1930, 76.7 per cent was burned with coal alone, as compared with 77.1 per cent in 1929; 4.2 per cent was burned with oil alone, as compared with 4.4 per cent in 1929; and 4.7 per cent was burned with natural gas alone, as compared with 3.5 per cent in 1929.

As summarized from the reports of the cement producers, the following quantities of fuel were consumed at the Portland-cement plants in the United States in 1930 in the production of 161,197,228 barrels of finished cement: Coal, 8,561,595 short tons; oil, 1,968,018 barrels (or 82,656,756 gallons); and natural gas, 41,255,809,368 cubic feet. Corresponding figures from the producers' reports for 1929 are as follows: Finished cement produced, 170,646,036 barrels; and fuels consumed in its manufacture—coal 9,340,434, short tons, oil 2,533,911 barrels (or 106,424,262 gallons), and natural gas 41,643,433,045 cubic feet. In the estimates of consumption of fuel per barrel of cement the production of finished cement alone is considered. In this connection it is of interest that the stock of clinker or unground cement at the mills at the end of 1930—8,809,000 barrels—as shown in the tables on pages 412 and 422 was 17 per cent in excess of the stock of clinker at the mills at the end of 1929—7,526,000 barrels.

Coal was reported as the only fuel used at 120 plants in the United States in 1930, as compared with 125 plants in 1929. The apparent average consumption in 1930 was 127.9 pounds of coal per barrel of finished cement, as compared with 132.3 pounds of coal per barrel of finished cement in 1929. The 55 dry-process plants using coal as the only fuel in 1930 reported a total consumption of 4,273,538 short tons of coal in the manufacture of 68,712,446 barrels of finished cement, or an average consumption of 124.4 pounds of coal per barrel of finished cement, as compared with the consumption in 1929 at 61 dry-process plants, where coal was reported as the only fuel used, of 4,939,438 short tons of coal in the manufacture of 77,474,985 barrels of finished cement, or an average consumption of 127.5 pounds of coal per barrel of finished cement.

Sixty-five wet-process plants reported the use of coal alone as fuel in 1930, with a total consumption of 3,640,014 short tons in the manufacture of 55,012,869 barrels of finished cement, or an average consumption of 132.3 pounds of coal per barrel of finished cement. In 1929, 64 wet-process plants reported the use of coal alone as fuel, with a total consumption of 3,767,152 short tons of coal in the manufacture of 54,160,610 barrels of finished cement, or an average consumption of 139.1 pounds of coal per barrel of finished cement.

Eleven plants, in four States, reported the use of oil alone as fuel in 1930, with a total consumption of 1,702,303 barrels in the manufacture of 6,769,668 barrels of finished cement, or an average of 0.2515 barrel (10.6 gallons) per barrel of finished cement; in other words, 1 barrel of oil burned nearly 4 barrels of cement. The average consumption of oil by the dry-process plants was 0.2454 barrel (or 10.3 gallons) per barrel of finished cement and by the wet-process plants 0.2534 barrel (10.6 gallons) per barrel of finished cement. The use of oil in 1930 was reported at 12 additional plants, which also used other fuel; 1 of these plants was east and 11 were west of the Mississippi River. Ten plants, all in the Pacific Coast States, reported the use of oil alone as fuel in 1929, with a total consumption of 2,006,596 barrels in the manufacture of 7,535,579 barrels of finished cement, or an average of 0.2663 barrel (about 11 gallons) per barrel of finished cement; in other words, 1 barrel of oil burned more than 3.7 barrels of cement. The average consumption of oil by the dry-process plants was 0.2433 barrel (or about 10 gallons) per barrel of finished cement and by the wet-process plants 0.2746 barrel (11.5 gallons) per barrel of finished cement. The use of oil in 1929 was reported at 15 additional plants, which also used other fuel; 3 of these plants were east and 12 west of the Mississippi River.

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[3] The statistics on fuels in 1929 and 1930 include estimated consumption of fuel for one plant which manufactures from purchased clinker only.

Ten plants reported natural gas as the only fuel used in 1930, as compared with seven plants in 1929. The average consumption in 1930 was 1,916.8 cubic feet of gas per barrel of finished cement; the corresponding figure for 1929 is 2,008.1 cubic feet. The use of natural gas was reported by 18 additional plants which also used other fuel in 1930 and by 17 additional plants which also used other fuel in 1929.

Since 1927, the first year for which figures on the quantities of fuels consumed in the manufacture of Portland cement were collected by the Bureau of Mines, the use of natural gas in the industry has steadily increased; its growth has been reflected by declines in the use of coal and oil. During 1930 natural gas was used as fuel at 28 plants located in 10 States, as compared with 24 plants in 8 States in 1929. Fifteen plants located in five States reported the use of natural gas in 1927.

In addition to the above fuels one plant reported the use of manufactured gas in 1929 and 1930, and one plant reported the use of petroleum coke in 1930. Both plants also reported the use of coal.

Portland cement burned, 1929 and 1930, by kinds of fuel

Fuel	Finished cement produced			Fuel consumed		
	Number of plants	Barrels of 376 pounds	Per cent of total	Coal (short tons)	Oil (barrels of 42 gallons)	Natural gas (cubic feet)
1929						
Coal	125	[1] 131,635,595	77.1	[2] 8,706,590	------------	---------------
Oil	10	[1] 7,535,579	4.4	------------	2,006,596	---------------
Natural gas	7	[1] 5,941,147	3.5	------------	------------	11,930,600,000
Coal and oil	4	25,533,715	15.0	633.844	527,315	29,712,833,045
Coal and natural gas	6					
Oil and natural gas	7					
Coal, oil, and natural gas	4					
	163	170,646,036	100.0	[3] 9,340,434	2,533,911	41,643,433,045
1930						
Coal	120	[1] 123,725,315	76.7	[4] 7,913,552	------------	---------------
Oil	11	[1] 6,769,668	4.2	------------	1,702,303	---------------
Natural gas	10	[1] 7,510,630	4.7	------------	------------	14,396,715,102
Coal and oil	2	23,191,615	14.4	648,043	265,715	26,859,094,266
Coal and natural gas	8					
Oil and natural gas	5					
Coal, oil, and natural gas	5					
	161	161,197,228	100.0	[5] 8,561,595	1,968,018	41,255,809,368

[1] Average consumption of fuel per barrel of cement produced was as follows: 1929—Coal, 132.3 pounds; oil, 0.2663 barrel; natural gas, 2,008.1 cubic feet. 1930—Coal, 127.9 pounds; oil, 0.2515 barrel; natural gas, 1,916.8 cubic feet.

[2] In addition to the coal shown for this group, 1 of the plants reports using manufactured gas with coal.

[3] Includes 204,084 short tons of anthracite, 9,114,391 short tons of bituminous coal, and 21,959 short tons of lignite.

[4] In addition to the coal shown for this group, 1 of the plants reports using some petroleum coke with coal and 1 plant reports using manufactured gas with coal.

[5] Includes 173,005 short tons of anthracite, 8,374,216 short tons of bituminous coal, and 14,374 short tons of lignite.

The following table shows the total fuels used and the finished cement produced by the wet and dry processes in 1929 and 1930.

Portland cement burned and fuels used, 1929 and 1930, by processes

Process	Finished cement produced			Fuel consumed		
	Number of plants [1]	Barrels	Per cent of total	Coal (short tons)	Oil (barrels)	Natural gas (cubic feet)
1929						
Wet	88½	73,636,889	43.2	[2] 3,934,032	1,821,690	23,184,018,063
Dry	74½	97,009,147	56.8	5,406,402	712,221	18,459,414,982
	163	170,646,036	100.0	[3] 9,340,434	2,533,911	41,643,433,045
1930						
Wet	89½	73,554,129	45.6	[4] 3,757,680	1,339,940	25,118,630,719
Dry	71½	87,643,099	54.4	4,803,915	628,078	16,137,178,649
	161	161,197,228	100.0	[5] 8,561,595	1,968,018	41,255,809,368

[1] A wet mill and a dry mill in 1 plant are each counted as half a plant.

[2] In addition to the coal shown for this group, 1 of the plants reports using manufactured gas with coal.

[3] Includes 204,084 short tons of anthracite, 9,114,391 short tons of bituminous coal, and 21,959 short tons of lignite.

[4] In addition to the coal shown for this group, 1 of the plants reports using some petroleum coke with coal and 1 plant reports using manufactured gas with coal.

[5] Includes 173,005 short tons of anthracite, 8,374,216 short tons of bituminous coal, and 14,374 short tons of lignite.

Estimated clinker (unground cement) produced and in stock at mills in the United States, 1929 and 1930, by processes, in barrels

Process	Number of plants [1]		Production		Stock (Dec. 31)	
	1929	1930	1929	1930	1929	1930
Wet	88½	89½	73,221,000	73,715,000	3,745,000	[2] 4,458,000
Dry	71½	70½	95,767,000	87,277,000	[3] 3,781,000	[4] 4,351,000
	160	160	168,988,000	160,992,000	[3] 7,526,000	[5] 8,809,000

[1] A wet mill and a dry mill in 1 plant are each counted as half a plant.

[2] Includes some stock at 1 plant which reports no manufacture of clinker in 1930.

[3] Includes some stock at 2 plants which report no manufacture of clinker in 1929.

[4] Includes some stock at 2 plants which report no manufacture of clinker in 1930.

[5] Includes some stock at 3 plants which report no manufacture of clinker in 1930.

ELECTRIC POWER

In connection with the statistics on fuels used in the wet and dry processes of manufacture the following data on electrical energy used at the Portland-cement plants are of interest. These statistics were collected by the bureau for the first time for 1930. The figures, which include some estimates, show the total electrical energy purchased and that generated by the plants in 1930. Reports for a few plants explain a low consumption of electric power as due to the use of steam power in some parts of those plants instead of electricity.

Electrical energy used at Portland cement-producing plants in 1930, by processes, in kilowatt-hours

Process	Electrical energy used						Finished cement produced	Average electrical energy used per barrel of cement produced
	Generated at Portland-cement plants		Purchased		Total			
	Active plants[1]	Kilowatt-hours	Active plants	Kilowatt-hours	Kilowatt-hours	Per cent	Barrels	Kilowatt-hours
Wet	35½	587,077,234	69	845,077,258	1,432,154,492	46.8	73,554,129	19.5
Dry	44½	1,020,513,554	48	609,609,750	1,630,123,304	53.2	87,643,099	18.6
	80	1,607,590,788	117	1,454,687,008	3,062,277,796	100.0	161,197,228	19.0
Per cent of total electrical energy used	-------	52.5	-------	47.5	100.0	-----	-----------	---------

[1] A wet mill and a dry mill in 1 plant are each counted as half a plant.

Producers reported that 80 of the Portland cement-producing plants generated 52.5 per cent of the electric power consumed in the industry in 1930 and that at 117 plants purchased electric power amounted to 47.5 per cent of the total electric current consumed in the industry during the year. Thirty-six of the eighty plants reporting plant-generated electricity also reported the consumption of purchased electric power, while 44 plants generated all the electric power used.

CAPACITY

The capacity at the end of 1930 for producing finished Portland cement of the 163 shipping plants in 1930 and 2 plants inactive in 1930 but producing within the three previous years, according to manufacturers' reports supplemented by a few estimates, was 270,044,000 barrels per year. This total includes increased capacity due to extensions and improvements at old plants. No new plants were reported as entering production in 1930. The capacity of one plant reported out of business in 1930 and idle in that year and in the two previous years has been excluded from the figures for 1930. The total production for 1930 was 59.7 per cent of the indicated capacity, based on producers' reports, at the close of the year; the corresponding figure for 1929 was 65.9 per cent.

Portland cement-manufacturing capacity of the United States, 1929 and 1930, by districts

District	Estimated capacity (barrels)		Per cent of capacity utilized	
	1929	1930	1929	1930
Eastern Pennsylvania, New Jersey, and Maryland	53,983,000	56,019,000	69.9	62.7
New York and Maine	18,449,000	19,009,000	61.9	59.7
Ohio, western Pennsylvania, and West Virginia	26,400,000	28,652,000	67.9	61.5
Michigan	18,535,000	19,241,000	74.2	59.8
Wisconsin, Illinois, Indiana, and Kentucky	29,293,000	31,393,000	73.0	64.4
Virginia, Tennessee, Alabama, Georgia, Florida, and Louisiana	25,034,000	26,491,000	55.1	48.6
Eastern Missouri, Iowa, Minnesota, and South Dakota	22,661,000	24,242,000	69.3	68.9
Western Missouri, Nebraska, Kansas, Oklahoma, and Arkansas	17,136,000	17,883,000	72.3	70.0
Texas	9,950,000	10,359,000	74.1	65.5
Colorado, Montana, Utah, Wyoming, and Idaho	6,669,000	6,769,000	40.4	33.5
California	23,350,000	22,405,000	56.1	45.2
Oregon and Washington	7,457,000	7,581,000	45.5	54.0
	258,917,000	270,044,000	65.9	59.7

The following estimates of the relation between the production of finished Portland cement and the manufacturing capacity of the industry for each month in 1930 and for the 12 months ending with each month, based on the monthly reports of the producers, indicate the seasonal changes in the utilization of capacity. These estimates include increases in production and capacity due to improvements at old plants.

Ratio (per cent) of finished Portland cement produced to manufacturing capacity, 1929 and 1930

	Monthly		12 months ended—			Monthly		12 months ended—	
	1929	1930	1929	1930		1929	1930	1929	1930
January	46.5	38.8	71.0	65.5	July	80.4	77.8	68.9	66.1
February	44.8	41.5	71.0	65.6	August	86.1	81.0	68.2	65.6
March	47.4	51.5	70.9	66.1	September	81.8	75.7	67.5	65.2
April	67.1	64.0	71.1	66.0	October	77.0	65.4	67.3	64.2
May	76.4	78.9	70.2	66.2	November	66.6	51.7	66.8	62.6
June	80.9	81.4	69.0	66.4	December	51.5	38.2	66.4	61.5

The following table gives statistics of capacity by the two general methods—the "wet" and the "dry"—used in the manufacture of Portland cement at plants in the United States. The figures given are based on the estimated capacity of the wet and dry process plants for the manufacture of finished cement. The figures show that in 1930 the wet-process plants, representing 44.9 per cent of the total manufacturing capacity of the United States, in turning out 45.6 per cent of the finished cement produced in 1930, utilized 60.6 per cent of the wet-process capacity and that the dry-process plants, accredited with 55.1 per cent of the total manufacturing capacity of the United States, in turning out 54.4 per cent of the finished cement produced in 1930, utilized 58.9 per cent of the dry-process capacity. In 1929 the wet-process plants representing 42.2 per cent of the total manufacturing capacity, in turning out 43.2 per cent of the finished cement produced in that year, utilized 67.3 per cent of the wet-process capacity; the dry-process plants, accredited with 57.8 per cent of the total manufacturing capacity of the United States, in turning out 56.8 per cent of the finished cement produced in 1929, utilized 64.9 per cent of the dry-process capacity. Statistics of production of both clinker and finished cement, by processes, appear on page 422.

Portland cement-manufacturing capacity of the United States, 1929 and 1930, by processes

Process	Estimated capacity				Per cent of capacity utilized		Per cent of total finished cement produced	
	Barrels		Per cent of total					
	1929	1930	1929	1930	1929	1930	1929	1930
Wet	109,347,000	121,354,000	42.2	44.9	67.3	60.6	43.2	45.6
Dry	149,570,000	148,690,000	57.8	55.1	64.9	58.9	56.8	54.4
	258,917,000	270,044,000	100.0	100.0	65.9	59.7	100.0	100.0

SPECIAL CEMENTS

A number of types of cement are now being manufactured and put on the market in increasing quantities in the United States in addition to the standard or "ordinary" Portland cement. These have been developed in response to a demand for cement of certain pronounced qualities or characteristics, such as greater plasticity, high early strength, and waterproofing qualities for special needs or uses. As stated, such special cements as the white Portland cement and the plastic and waterproofed Portland cement have long been produced and marketed in the United States and have been included in the statistics in Mineral Resources. Alumina cement, a hydraulic cement noted especially for its attainment of high strength at early periods, has been manufactured in the United States for some years.

Among the natural cements that are noted for their plasticity and are much used in masonry, the producers now report "mixed" and "improved" cements.

According to the reports of the producers, 4,998,259 barrels of special cements of the Portland-cement class were manufactured in the United States in 1930, as compared with 5,121,539 barrels in 1929; and 4,679,523 barrels, valued at $8,025,712, were shipped from the mills in 1930, as compared with 4,935,594 barrels, valued at $8,834,322, in 1929. These figures do not include statistics of white Portland cement, as the Bureau of Mines is not at liberty to publish such figures separately. Companies reported the shipment of special cements of their own manufacture from 31 plants in 15 States in 1930, as compared with the shipment of special cements from 38 plants in 16 States in 1929.

Manufacturers in 10 States reported the production in 1930 of 3,841,599 barrels of high-early-strength Portland cement, which represents an increase of 3 per cent compared with 1929 and of 138 per cent compared with 1927, the first year for which statistics of these cements were collected by the Bureau of Mines. The production of the various special cements included under plastic and waterproofed Portland cement decreased 17 per cent in 1930 as compared with 1929. The statistics of special cements are shown separately in the following table; they are included in the general statistics for Portland cement throughout this report. Although a cement classified in one group may have qualities or characteristics by which another group is designated (for example, a high-early-strength Portland cement which is also plastic), the grouping in the table follows the name or characteristic reported by the producer.

Special Portland cements reported produced and shipped in the United States, 1929 and 1930, by types [1]

Type	Number of plants reporting		Production (barrels)		Shipments				Average factory value per barrel	
					1929		1930			
	1929	1930	1929	1930	Barrels	Value	Barrels	Value	1929	1930
High-early-strength Portland cement [2]	14	12	3, 723, 115	3, 841, 599	3, 545, 754	$5, 718, 813	3, 529, 468	$5. 818, 822	$1. 61	$1. 65
Plastic and waterproofed Portland cement [3]	33	21	1, 398, 424	1, 156, 660	1, 389, 840	3, 115, 509	1, 150, 055	2, 206, 890	2. 24	1. 92

[1] Classified according to names or characteristics reported by the producers.

[2] In 1929 includes cement reported as "quick-hardening."

[3] Includes so-called "Oil-well," "Plastite," and "Super" Portland cements, and some cement reported suitable for mortar and masonry.

MASONRY, NATURAL, AND PUZZOLAN CEMENTS

The term "masonry cement" is used here to designate certain cements made, like natural cements, by grinding calcined calcareous rock and used largely in mortar for laying brick and stone, although other hydraulic cements are also suitable for masonry and are being manufactured in increasing quantities for this purpose.

Natural cement, including masonry cement, was produced in 1930 in 10 plants, situated as follows: Utica, Ill.; Speed, Ind.; Fort Scott, Kans.; Kosmosdale, Ky.; Austin and Mankato, Minn.; Brixment and Rosendale, N. Y.; Lisbon, Ohio; and Siegfried, Pa.

One manufacturer with a plant at Birmingham, Ala., reports an output of puzzolan or slag-lime cement, and in order that this output may be included in the cement totals for the United States without disclosure it is included with the statistics of masonry and natural cements.

The next table, which gives figures on the output of masonry, natural, and puzzolan cements from 1925 to 1930, shows a production in 1930 of 1,792,083 barrels, a decrease of 19 per cent as compared with 1929. Shipments of these cements from mills in 1930 decreased 17 per cent in quantity and 16 per cent in gross value as compared with 1929. Stocks at the mills were 2.6 per cent higher at the end of 1930 than at the end of 1929. The average factory value per barrel of the cement shipped from the mills in 1930 was $1.38, as compared with $1.37 in 1929. As with Portland cement, these cements are packed four sacks to the barrel; each sack holds about 1 cubic foot. The lower specific gravity of the non-Portland cements accounts for their lighter weight per barrel, the barrels ordinarily ranging in weight from 240 to 320 pounds. For statistical purposes, the output has been expressed in terms of 376-pound barrels to correspond with the figures for Portland cement.

Producers reported that 32,121 short tons of coal was consumed in 1930 in the manufacture of these cements; in addition, they reported the use of small quantities of oil and gas having a total fuel value equivalent to approximately 505 short tons of coal. The fuel consumption in 1929 amounted to 36,474 short tons of coal; in addition, small quantities of coke and gas having a total fuel value equivalent to approximately 3,521 short tons of coal were reported as consumed.

At natural-cement plants in the United States where coal was reported as the only fuel used the average consumption in 1930 was 45 pounds of coal per barrel (376 pounds) of cement, as compared with an average consumption in 1929 of 43 pounds of coal per barrel (376 pounds) of cement.

Masonry, natural, and puzzolan cements produced, shipped, and in stock at mills in the United States, 1925–1930

Year	Production		Shipments		Stock (Dec. 31)
	Active plants	Barrels of 376 pounds	Barrels of 376 pounds	Value	Barrels of 376 pounds
1925	10	1,729,343	1,751,725	$2,551,583	107,459
1926	11	2,104,891	2,031,851	2,820,110	181,928
1927	11	2,123,868	2,158,323	2,881,029	143,854
1928	11	2,210,404	2,213,645	2,910,097	137,357
1929	11	2,209,465	2,159,130	2,950,717	[1] 194,207
1930	11	1,792,083	1,787,016	2,469,531	199,274

[1] Revised figures.

IMPORTS AND EXPORTS[4]

IMPORTS

The quantities given in the following tables include imports of hydraulic cement of all kinds.

Imports of hydraulic cement into the United States in 1930—975,546 barrels—decreased 43.5 per cent from 1929. Belgium, Denmark, and the United Kingdom were the leading sources of the imports, in the order named, in 1930 as in 1929. The imports, by countries, were approximately as follows: From Belgium, 447,000 barrels (nearly 46 per cent of the total imports); Denmark, 283,000 barrels; United Kingdom, 201,000 barrels; and other countries, 45,000 barrels. The districts into which more than 200,000 barrels of cement were imported in 1930 are, in order, Massachusetts, Porto Rico, and New York. The total quantity imported into these three districts and into the district of Los Angeles was nearly 81 per cent of the total imports into the United States in 1930. The average of the values assigned to the imports, which are supposed to represent the values in the foreign countries from which the material is exported, including the cost of the containers or coverings, was $1.16, an increase of 4 cents per barrel as compared with 1929.

The tariff act of 1922 contained the following paragraph on the importation of hydraulic cement:

> Par. 1543. Cement: Roman, Portland, and other hydraulic: *Provided*, That if any country, dependency, province, or other subdivision of government imposes a duty on such cement imported from the United States, an equal duty shall be imposed upon such cement coming into the United States from such country, dependency, province, or other subdivision of government.

The tariff act of 1930, which went into effect June 18, 1930, displacing the tariff act of 1922, contained the following paragraph on the importation of hydraulic cement:

> Par. 205. Roman, Portland, and other hydraulic cement or cement clinker, 6 cents per 100 pounds, including the weight of the container; white nonstaining Portland cement, 8 cents per 100 pounds, including the weight of the container.

Roman, Portland, and other hydraulic cements imported into the United States, 1929 and 1930, by countries

[General imports]

Country	1929		1930	
	Barrels	Value	Barrels	Value
Belgium	1,186,166	$1,176,619	446,736	$472,045
Canada	5,803	13,253	11,936	18,002
Denmark	319,679	413,805	283,457	351,854
France	7,882	16,261	9,537	19,711
Germany	18,186	33,914	11,235	24,706
Italy	1,180	4,338	10	22
Japan			11.344	13,761
Norway	10,450	12,196	25	39
Sweden	139	573		
United Kingdom	178,415	267,281	201,266	235,673
	1,727,900	1,938,240	975,546	1,135,813

---

[4] Figures on imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

Roman, Portland, and other hydraulic cements imported into the United States, 1929 and 1930, by districts

[General imports]

District	1929		1930	
	Barrels	Value	Barrels	Value
Alaska	48	$218		
Connecticut	3,000	3,094		
Duluth-Superior	9	23		
Florida	15,750	17,188	3,450	$3,828
Galveston	14,400	21,297		
Hawaii	100	212	11,344	13,761
Los Angeles	494,618	300,868	155,234	120,153
Maine and New Hampshire	5,740	12,997	2,190	5,820
Maryland	3,489	7,000	180	213
Massachusetts	280,501	351,131	216,490	274,235
New Orleans	36,473	45,102	4,700	5,620
New York	312,978	430,289	202,897	232,999
North Carolina	38,495	47,879		
Oregon	34,461	41,968	3,000	3,588
Philadelphia	71,333	97,200	155,047	178,401
Porto Rico	278,214	391,166	214,549	290,344
Rhode Island	35,750	45,105		
Sabine	5,500	8,988		
San Antonio	19,432	20,825	6,300	6,429
San Francisco	9,091	11,589	127	326
South Carolina	63,245	77,899		
Vermont	6	15	38	96
Virginia	3,017	3,280		
Washington	2,250	2,907		
	1,727,900	1,938,240	975,546	1,135,813

Roman, Portland, and other hydraulic cements imported into the United States in 1930, by countries and districts

[General imports]

Country and district	Barrels	Value
Belgium:		
Florida	3,450	$3,828
Los Angeles	143,647	93,645
Maryland	155	174
Massachusetts	212,935	266,178
New Orleans	4,700	5,620
New York	29,630	32,639
Oregon	3,000	3,588
Philadelphia	29,418	40,463
Porto Rico	13,501	19,481
San Antonio	6,300	6,429
	446,736	472,045
Canada:		
Maine and New Hampshire	2,190	5,820
Porto Rico	9,708	12,086
Vermont	38	96
	11,936	18,002
Denmark:		
New York	92,117	93,077
Porto Rico	191,340	258,777
	283,457	351,854
France:		
Massachusetts	3,555	$8,057
New York	5,982	11,654
	9,537	19,711
Germany:		
Los Angeles	11,089	24,308
New York	19	72
San Francisco	127	326
	11,235	24,706
Italy: New York	10	22
Japan: Hawaii	11,344	13,761
Norway: Maryland	25	39
United Kingdom:		
Los Angeles	498	2,200
New York	75,139	95,535
Philadelphia	125,629	137,938
	201,266	235,673
	975,546	1,135,813

In addition to the imports shown in the preceding tables, "white nonstaining Portland cement" was recorded as "imported for consumption," as follows: 1929, 25,072 barrels, valued at $54,045; 1930, 9,261 barrels, valued at $18,749, of which, beginning June 18, 1930, 5,321 barrels, valued at $11,103, were imported from France. The source of these imports, by countries, prior to June 18, 1930, is not recorded; the figures are included in those shown in the following table:

Hydraulic cement imported for consumption in the United States, 1921–1930

Year	Barrels	Value	Year	Barrels	Value
1921	122, 317	$388, 842	1926	3, 244, 223	$5, 154, 926
1922	355, 931	692, 429	1927	2, 065, 730	3, 007, 103
1923	1, 767, 264	3, 145, 977	1928	2, 302, 475	3, 135, 558
1924	2, 023, 663	3, 139, 788	1929	1, 745, 345	1, 983, 974
1925	3, 667, 458	5, 836, 482	1930	984, 807	1, 154, 562

EXPORTS

In 1930 the hydraulic cement exported to foreign countries and to the Philippine Islands and the Virgin Islands of the United States (most of it Portland cement) decreased more than 14.6 per cent in quantity and nearly 20.4 per cent in value as compared with 1929. The quantity exported in 1930 was 0.5 per cent of the total shipments of hydraulic cement from mills during the year; it was the smallest recorded since 1906.

The value of exports of domestic cement is the actual cost at the time of exportation in the ports of the United States whence they are exported, as declared by the shipper on the export declarations. The average value at the ports in 1930 was $3.25 a barrel, as compared with $3.48 in 1929.

The destinations of exports were approximately as follows: To South America, 234,000 barrels; Central America, 177,000 barrels; Mexico, 127,000 barrels; Cuba, 66,000 barrels; other West Indies and Bermudas, 53,000 barrels; Canada, 51,000 barrels; and other countries, 48,000 barrels.

Although the United States is the major cement-producing country of the world, its export trade has never reached large proportions; since 1925 it has been under 1,000,000 barrels. During recent years strong competition from Japan and from manufacturers in Europe, where in the leading industrial countries capacity for the manufacture of cement is in excess of the home demand and where labor costs are much lower than in the United States, has restricted the foreign market for American cement.

Hydraulic cement exported from the United States, 1929 and 1930, by countries

Country	1929		1930	
	Barrels	Value	Barrels	Value
North America:				
Canada	60, 172	$273, 079	51, 367	$204, 913
Central America—				
British Honduras	3	30	51	144
Costa Rica	3, 190	8, 963	491	2, 128
Guatemala	3, 082	10, 911	1, 890	7, 155
Honduras	37, 663	95, 717	47, 673	107, 935
Nicaragua	2, 530	8, 141	2, 941	9, 795
Panama	95, 266	221, 562	122, 796	305, 449
Salvador	1, 325	7, 910	555	3, 409
Mexico	174, 208	531, 982	126, 803	370, 612
Miquelon, Langley, and St. Pierre Islands	1	8	--------	--------
Newfoundland and Labrador	535	1, 979	770	2, 371
West Indies—				
British—				
Barbados	10	65	12	78
Bermudas	2, 435	5, 933	6, 988	17, 174
Jamaica	6	38	384	2, 711
Trinidad and Tobago	2, 075	6, 528	5	32
Other British	19, 418	44, 930	16, 826	35, 915

Hydraulic cement exported from the United States, 1929 and 1930, by countries—Continued

Country	1929		1930	
	Barrels	Value	Barrels	Value
North America—Continued.				
West Indies—Continued.				
Cuba	102, 257	$247, 876	66, 258	$168, 345
Dominican Republic	2, 926	11, 626	1, 663	4, 350
French	40	100	476	1, 291
Haiti	13, 247	26, 002	8, 477	14, 633
Netherland	26, 467	76, 503	18, 087	39, 599
Virgin Islands of the United States	647	1, 755	99	281
South America:				
Argentina	70, 264	408, 744	55, 620	296, 231
Bolivia	7, 598	22, 415	4, 083	11, 024
Brazil	25, 637	136, 182	16, 302	85, 566
Chile	7, 907	38, 805	7, 806	45, 611
Colombia	29, 325	113, 857	33, 692	72, 674
Ecuador	2, 045	6, 475	1, 080	5, 224
Guiana—				
British	5	34		
French	495	1, 279	495	1, 238
Surinam			54	338
Peru	6, 508	26, 277	2. 807	15, 026
Uruguay	16, 519	96, 575	16, 588	87, 802
Venezuela	108, 090	269, 900	95, 066	256, 700
Europe:				
Azores and Madeira Islands	155	959	12	84
Belgium	427	2, 383	518	2, 893
Czechoslovakia	100	555		
Denmark	167	1, 229	40	263
France	15	97	2	12
Germany	3, 255	17, 932	2, 189	11, 724
Greece	520	3, 142	997	5, 615
Irish Free State	298	1, 718	299	1, 721
Italy	32	165	47	167
Netherlands	375	2, 229	606	3, 602
Norway	895	5, 505	680	4, 175
Portugal	190	1, 155	110	666
Soviet Russia			83	1, 109
Spain	356	2, 136	10	75
Sweden	15	100	33	195
United Kingdom	30, 118	168, 945	25, 180	143, 474
Asia:				
Arabia	50	190	300	882
China	1, 038	5, 856	980	6, 063
East Indies—				
British—				
Ceylon	40	259	90	614
India	3, 861	23, 091	2, 910	17, 450
Malaya	3, 990	22, 797	1, 039	6, 170
Netherland—				
Java and Madura	1, 105	6, 360	654	3, 809
Other Netherland	165	1, 810	686	4, 909
Hong Kong	965	5, 699	650	3, 993
Iraq	168	1, 018		
Japan	2, 837	21, 931	1, 610	11, 929
Kwantung	1	5		
Palestine	1, 138	6, 679	1, 502	9, 069
Persia	322	12, 115	13	56
Philippine Islands	197	1, 713	381	2, 502
Soviet Russia			2	12
Syria			259	1, 553
Africa:				
British—				
East	375	2, 626		
Union of South	943	5, 845	463	2, 955
West	125	319		
Other			16	78
French—Other	375	955		
Liberia	3	11		
Portuguese—				
Mozambique	315	1, 910	307	1, 101
Other Portuguese	8	21	105	350
Oceania:				
British—				
Australia	4, 427	26, 941	2, 183	13, 580
New Zealand	4, 009	24, 491	2, 537	15, 542
Other British	40	116	80	369
French	10	28		
	885, 321	3, 083, 217	755, 778	2, 454, 515

Domestic hydraulic cement shipped to Alaska, Hawaii, and Porto Rico, 1929 and 1930

	1929		1930	
	Barrels	Value	Barrels	Value
Alaska	17,906	$54,052	23,957	$63,970
Hawaii	289,040	687,904	266,990	679,756
Porto Rico	45,397	105,325	54,193	100,547
	352,343	847,281	345,140	844,273

Hydraulic cement exported from the United States, 1921–1930

Year	Barrels	Value	Per cent of total shipments from mills	Year	Barrels	Value	Per cent of total shipments from mills
1921	1,181,014	$4,276,986	1.2	1926	974,326	$2,995,833	0.6
1922	1,127,845	3,206,201	1.0	1927	816,726	2,796,717	.5
1923	1,001,688	2,944,174	.7	1928	824,656	2,938,702	.5
1924	878,543	2,615,154	.6	1929	885,321	3,083,217	.5
1925	1,019,597	3,003,128	.6	1930	755,778	2,454,515	.5

CEMENT PRODUCTION IN CANADA

The total mill output of Portland cement in Canada in 1930 was 11,790,408 barrels, according to the Dominion Bureau of Statistics. The shipments amounted to 11,032,538 barrels, valued at $17,713,067, as compared with 12,284,081 barrels, valued at $19,337,235, in 1929, a decrease of 10.2 per cent in quantity and of 8.4 per cent in value. The average selling price over the whole Dominion, computed from the total quantity sold and the total value as given, was $1.61 per barrel in 1930 and $1.57 per barrel in 1929.

The apparent consumption of cement in Canada in 1930 showed a decrease of 9.3 per cent as compared with 1929. Imports of Portland cement in 1930 amounted to 143,436 barrels, having an average value of $3.97 per barrel, as compared with an average of $3.38 per barrel in 1929. Exports of Portland cement amounted to 198,736 barrels, valued at $212,071.

Summary statistics of the cement industry in Canada, 1929 and 1930 [1]

	1929		1930	
	Barrels	Value	Barrels	Value
Output	12,252,203		11,790,408	
Sold or used	12,284,081	$19,337,235	11,032,538	$17,713,067
Stocks, Dec. 31	1,488,751		2,246,621	
Imports:				
Portland	55,980	189,169	143,436	569,848
Manufactures		64,942		34,672
Exports	234,111	252,955	198,736	212,071
Apparent consumption	12,105,950		10,977,238	

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[1] Dominion Bureau of Statistics.

Cement is produced in the Provinces of Quebec, Ontario, Manitoba, Alberta, and British Columbia. Eleven plants were represented in the output in 1929 and 1930. In 1930 mills in Quebec produced 44 per cent of the total Canadian shipments; in Ontario, 36 per cent; in Manitoba, 9 per cent; in Alberta, 5 per cent; and in British Columbia 6 per cent.

The total capital employed by the eight firms operating in the cement industry in Canada during 1930 was $59,210,737. Employment was furnished 126 salaried employees and 2,191 wage earners; their combined earnings amounted to $3,172,198. Cost of fuel and electricity totaled $4,120,367, of which $1,608,969 was expended for Canadian coal; $1,697,627 for imported coal; $803,016 for purchased electrical energy; and smaller amounts for coke, gasoline, kerosene, and fuel oil. Fifty-seven rotary kilns were in operation during the year with a total daily capacity of 37,522 barrels; other plant equipment included 1,237 electric motors with a total rating of 73,295 horsepower and 9 hydraulic turbines rated at 5,336 horsepower.

The Canada Department of Mines in an article on the cement industry in Canada states[5] the following:

> The chief product is Portland cement for the production of which there are 12 operating plants having an aggregate rated annual capacity of about 14,000,000 barrels. The large excess capacity over production is due to the fact that plants were built to take care of an anticipated demand which has not materialized. In the east the plants are operated throughout the year at a percentage of the rated capacity, while in the west the plants are operated to capacity and only part of the year, owing to the extreme cold weather.
>
> If business justified such a course all plants could operate throughout the year because most plants are now equipped with stock houses sufficient to take care of the natural contraction of sales during the winter season.
>
> In addition to the plants manufacturing Portland cement, there is one in Nova Scotia capable of making cement from blast-furnace slag and one in Manitoba making puzzolan or natural rock cement.
>
> The production of cement in 1930 was about 79 per cent of the total capacity of the milling plants. The production in 1929 was about 82 per cent of the total capacity, being the highest ever reported, the next highest production having been obtained in 1928, and amounted to 73 per cent of the total capacity.

The average selling price per barrel, by Provinces, in 1930, computed from the quantity sold and the value as given was as follows: Quebec, $1.45; Ontario, $1.47; Manitoba, $2.32; Alberta, $2.18; and British Columbia, $2.07.

The following table shows sales from mills in 1929 and 1930, by Provinces:

Cement sold by Canadian mills, 1929 and 1930, by Provinces[a]

Province	1929		1930	
	Barrels	Value	Barrels	Value
Quebec	5, 169, 408	$7, 120, 374	4, 865, 609	$7, 031, 528
Ontario	4, 624, 712	6, 608, 246	3, 942, 690	5, 779, 404
Manitoba	1, 000, 258	2, 350, 606	977, 906	2, 268, 742
Alberta	808, 796	1, 770, 786	525, 289	1, 144, 160
British Columbia	680, 907	1, 487, 223	721, 044	1, 489, 233
Canada	12, 284, 081	19, 337, 235	11, 032, 538	17, 713, 067

[a] Dominion Bureau of Statistics.

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[5] The Canadian Mineral Industry in 1930, art. 40.

NATURAL GASOLINE[1]

By G. R. Hopkins and E. M. Seeley

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SUMMARY

The trend of natural-gasoline production, consistently upward since its beginning, showed a marked reversal in 1930, when the output failed to surpass the 1929 total. (See fig. 5.) The production in 1930 amounted to 2,210,494,000 gallons as compared with 2,233,688,000 gallons in 1929, a decrease of 1 per cent. In spite of this decline, the United States still ranks far ahead of the other nations in natural-gasoline production. In 1929, the latest year for which complete world figures are now available, the United States produced 91 per cent of the world total; however, the proportion produced by the other countries, while small, has grown steadily.

Natural gasoline is unique in that its production is influenced chiefly by the output of crude oil, because the supply of natural gas, the raw material, fluctuates with the activity in the crude-oil fields. In 1930 the output of crude was considerably below the record total of 1929; hence, the production of natural gasoline at the majority of those plants which operate on "wet" or casing-head gas was reduced. On the other hand, the demand for natural gas to supply the large pipe-line systems increased in 1930, and since this gas is usually treated before it is turned into the pipe lines the output of natural gasoline rose accordingly. Thus, the increase in the production of natural gasoline in the Texas Panhandle area, the point of origin for a number of large pipe lines, largely compensated for the decline in output at Seminole, the largest producing district and a "wet" gas area. The trend of natural-gasoline prices, which ordinarily does not exert much influence on production, tended to restrict the output of natural gasoline materially in 1930, because the price fell to such low levels that many of the small manufacturers were forced to cancel their gas contracts and most of the large companies curtailed the construction of new plants. Another factor in the decline in production in 1930 was the drop in yield due to growth in stabilization. To meet the new specifications for natural gasoline the manufacturers have found it necessary to do more stabilizing, which means that what formerly comprised the lightest ends of their product must now be utilized in some other way.

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[1] Work on manuscript completed October, 1931.

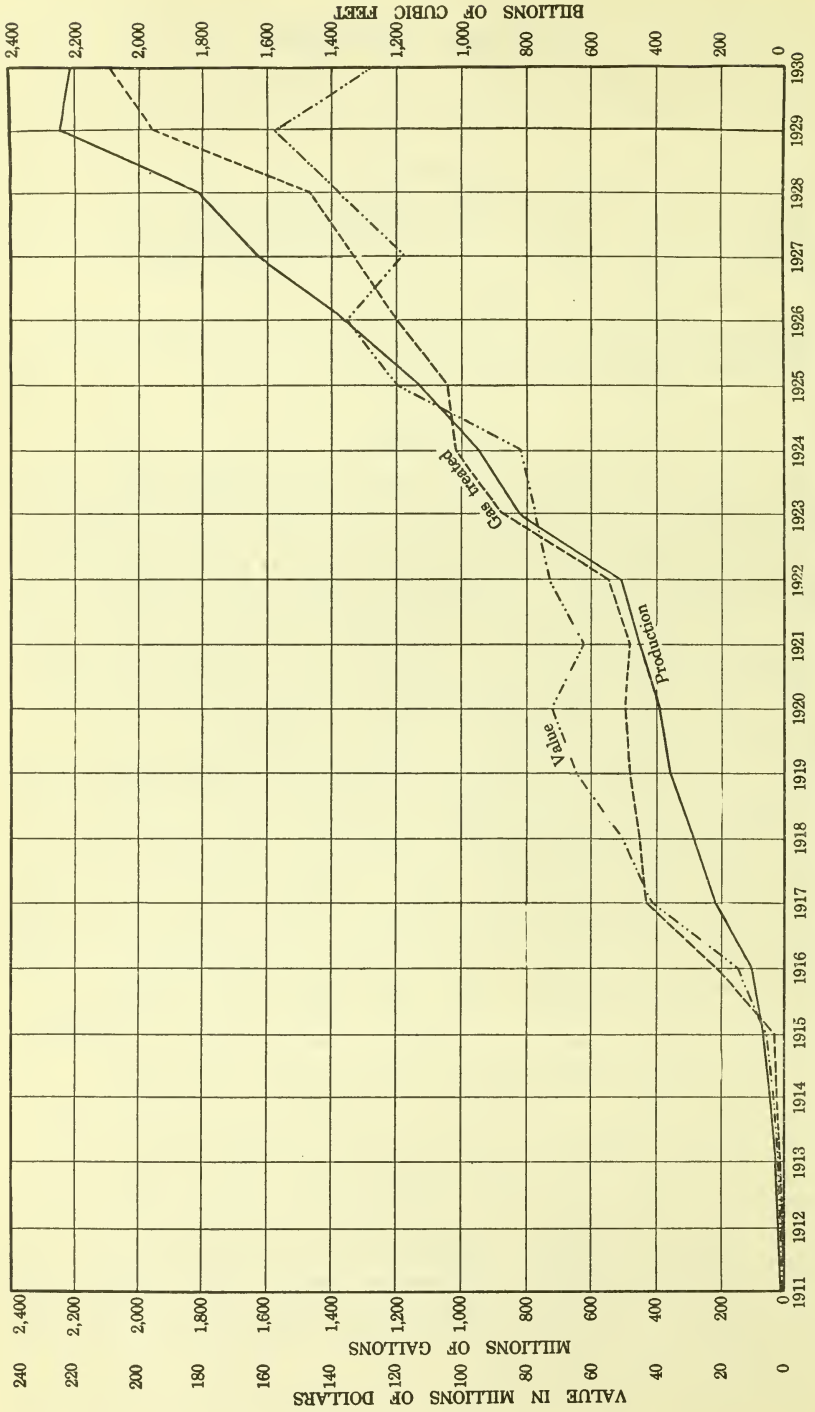

FIGURE 5.—Quantity and value of natural gasoline produced and volume of natural gas treated at plants, 1911–1930

Summary of statistics for natural gasoline in the United States, 1925–1930

	1925	1926	1927	1928	1929	1930
Number of plants operating	1,081	1,102	1,119	1,078	1,087	1,035
Production:						
By States—						
California .... millions of gallons	303	389	498	584	840	830
Oklahoma .... do	391	476	548	620	676	591
Texas .... do	214	243	321	324	420	491
Louisiana .... do	43	44	45	55	65	74
West Virginia .... do	58	64	64	70	73	63
Other .... do	118	147	165	161	160	161
	1,127	1,363	1,641	1,814	2,234	2,210
By types of process—						
Compression process .... do	238	243	242	226	259	250
Absorption and combination processes .... millions of gallons	882	1,100	1,377	1,564	1,950	1,942
Charcoal .... do	7	20	22	24	25	18
	1,127	1,363	1,641	1,814	2,234	2,210
Stocks at natural-gasoline plants at end of year .... millions of gallons	15	19	32	27	26	24
Value:						
Total (at plants) .... millions of dollars	120	136	119	139	158	128
Average per gallon (at plant) .... cents	10.7	10.0	7.2	7.7	7.1	5.8
Average spot price, Oklahoma natural gasoline, grade A .... cents	12.0	9.5	5.9	7.4	7.1	5.4
Natural gas treated .. millions of cubic feet	1,040,390	1,206,300	1,341,248	1,473,434	1,959,294	2,088,778
Average yield per thousand cubic feet .... gallons	1.08	1.13	1.22	1.23	1.14	1.06

PRODUCTION

Output by States.—California, with a production of 829,713,000 gallons in 1930, was again the leading producing State; Oklahoma, with a production of 591,194,000 gallons, was second; and Texas, with 491,299,000 gallons, was third. These three States rank far ahead of the others in output of natural gasoline; in fact, they produced 87 per cent of the total for the country in 1930. The only important change in rank of the producing States in 1930 was the displacement of West Virginia, which ranked fourth in 1929, by Louisiana. This resulted both from an increase in output in Louisiana and from a decline in West Virginia and reflects principally the increased demand for gas by pipe lines leading from the Monroe and Richland fields of Louisiana. The majority of the less important producing States reported a decreased output in 1930; the most notable exceptions were New Mexico and Wyoming. In New Mexico the development of large oil and gas fields in the southeast corner of the State led to the gain in output, whereas the output of natural gasoline in Wyoming was considerably augmented through the practice of introducing residue gas into the producing sands at Salt Creek.

Number of plants and operators.—The number of natural-gasoline plants has declined steadily in recent years, but the total capacity of the plants has increased consistently. The number of plants operated in 1930 totaled 1,035, which compares with 1,087 operated in 1929 and with the record total of 1,119 operated in 1927. The Bureau of Mines will not make its next biennial survey of natural-gasoline plants until January 1, 1932, hence very little information as to the capacity of the plants is available for 1930; however, it is believed that the total daily capacity as of December 31, 1930, was approximately 11,500,000 gallons, a gain of about 9 per cent over the previous year. Although this number indicates a substantial gain in the capacity of the natural-gasoline plants in 1930 the decline in prices in 1930 undoubtedly kept this increase under the expansion recorded in 1928 and 1929. California showed the largest gain in capacity of any State in 1930 chiefly because of the construction of a number of large plants in the Kettleman Hills field. The Panhandle district, Texas, experienced some plant expansion in 1930. The number of plants in Oklahoma decreased in 1930, but the total continued to rank well ahead of the other States. Next to Oklahoma in number of plants operated in 1930 were California, Texas, and Pennsylvania, in order of rank. The plants in Pennsylvania are of small capacity, hence the output of the State is equivalent to only a fraction of that in the other two States. The decline in number of plants has resulted chiefly from the decline in prices, which has made it unprofitable for some of the small plants to operate.

Natural gasoline produced in the United States, 1921–1930, by States, in thousands of gallons

Year	Alaska	Arkansas	California	Colorado	Illinois	Indiana	Kansas	Kentucky	Louisiana	New Mexico	New York
1921	--------	--------	58, 220	--------	7, 536	--------	3, 587	4, 242	15, 341	--------	366
1922	--------	4, 289	67, 120	--------	7, 760	--------	2, 856	5, 205	29, 406	--------	506
1923	--------	16, 183	173, 329	--------	7, 356	--------	8, 775	7, 601	40, 720	--------	408
1924	--------	17, 533	232, 579	--------	9, 091	--------	11, 658	7, 274	48, 098	--------	477
1925	33	19, 686	303, 180	35	9, 874	--------	19, 592	7, 685	43, 489	--------	414
1926	33	30, 385	389, 366	276	9, 987	--------	25, 369	7, 689	43, 557	1, 488	539
1927	19	37, 498	498, 020	912	8, 853	--------	36, 095	7, 480	44, 844	1, 827	449
1928	26	32, 677	584, 111	1, 909	7, 817	--------	36, 765	7, 267	55, 022	1, 506	392
1929	35	33, 455	840, 325	1, 630	7, 080	2	36, 227	6, 006	64, 957	1, 077	264
1930	39	30, 637	829, 713	1, 322	6, 867	2	35, 106	6, 641	73, 693	3, 663	208

Year	Ohio	Oklahoma	Pennsylvania	Texas	West Virginia	Wyoming	Total		
							Thousands of gallons	Value at plant	
								Thousands of dollars	Average per gallon (cents)
1921	9, 100	185, 341	19, 856	77, 141	54, 646	14, 558	449, 934	61, 815	13. 7
1922	8, 600	189, 404	18, 518	95, 405	56, 796	19, 967	505, 832	72, 711	14. 4
1923	10, 035	270, 249	19, 132	177, 765	63, 381	21, 292	816, 226	77, 268	9. 5
1924	9, 443	301, 062	19, 254	186, 571	61, 549	29, 272	933, 861	82, 233	8. 8
1925	8, 701	390, 861	18, 850	214, 092	58, 201	32, 777	1, 127, 470	120, 383	10. 7
1926	10, 817	475, 716	20, 343	243, 093	63, 807	40, 625	1, 363, 090	136, 412	10. 0
1927	12, 167	548, 109	16, 744	320, 723	64, 192	43, 212	1, 641, 144	118, 688	7. 2
1928	13, 174	619, 691	16, 571	324, 516	69, 729	42, 861	1, 814, 034	138, 944	7. 7
1929	11, 166	676, 030	18, 411	419, 485	72, 994	44, 544	2, 233, 688	158, 410	7. 1
1930	8, 937	591, 194	16, 713	491, 299	63, 328	51, 132	2, 210, 494	128, 160	5. 8

The number of operators or companies operating natural-gasoline plants has declined steadily in the past few years as a result both of the decrease in number of plants cited above and of mergers, many of which were forced on the operators when natural-gasoline prices fell below the cost of production. The average natural-gasoline company operates 3 plants, but a few companies operate more than 25.

Yields.—The average yield of natural gasoline per thousand cubic feet of gas treated fell from 1.14 gallons in 1929 to 1.06 gallons in 1930, which marks the second successive year in which the yield of natural gasoline has declined after a long period of increasing recovery. Practically all of the States showed a lower yield in 1930; the most notable exception was Wyoming, where the yield rose from 1.34 in 1929 to 1.73 in 1930. Arkansas continued to report the highest natural-gasoline yield of any State, although its yield dropped from 2.87 in 1929 to 2.64 in 1930. The principal cause of the widespread decline in yields in 1930 was the growth of stabilization, which cut down the volume produced through elimination of the lighter ends. A minor cause was the growth in relative importance of the Texas Panhandle, a "dry" gas district with a comparatively low yield.

Natural gasoline produced and natural gas treated in the United States, 1929 and 1930, by States

State	Number of operators [1]	Number of plants operating	Natural gasoline produced			Estimated quantity of natural gas treated	
			Thousands of gallons	Value of plant		Millions of cubic feet	Average yield per M cubic feet (gallons)
				Thousands of dollars	Average per gallon (cents)		
1929							
Alaska	1	1	35	4	11.4	27	1.30
Arkansas	11	14	33,455	2,419	7.2	11,644	2.87
California	48	153	840,325	67,009	8.0	617,648	1.36
Colorado	2	3	1,630	113	6.9	1,880	.87
Illinois	23	78	7,080	617	8.7	2,760	2.57
Indiana	1	1	2	(2)	------	2	1.00
Kansas	15	26	36,227	2,207	6.1	47,565	.76
Kentucky	7	9	6,006	486	8.1	23,479	.26
Louisiana	25	48	64,957	4,010	6.2	153,370	.42
New Mexico	1	1	1,077	71	6.6	555	1.94
New York	3	3	264	22	8.3	598	.44
Ohio	15	33	11,166	923	8.3	43,901	.25
Oklahoma	95	292	676,030	42,766	6.3	314,649	2.15
Pennsylvania	91	136	18,411	1,676	9.1	50,789	.36
Texas	56	159	419,485	26,561	6.3	479,543	.87
West Virginia	42	122	72,994	6,285	8.6	177,606	.41
Wyoming	5	8	44,544	3,241	7.3	33,278	1.34
	[1] 364	1,087	2,233,688	158,410	7.1	1,959,294	1.14
1930							
Alaska	1	1	39	5	12.8	30	1.30
Arkansas	10	14	30,637	1,757	5.7	11,624	2.64
California	45	148	829,713	57,974	7.0	627,733	1.32
Colorado	1	2	1,322	69	5.2	1,926	.69
Illinois	27	80	6,867	420	6.1	2,721	2.52
Indiana	1	1	2	(2)	------	1	2.00
Kansas	13	24	35,106	1,570	4.5	56,582	.62
Kentucky	5	6	6,641	385	5.8	25,432	.26
Louisiana	26	47	73,693	3,725	5.1	181,582	.41
New Mexico	3	3	3,663	169	4.6	2,381	1.54
New York	3	3	208	19	9.1	643	.32
Ohio	15	30	8,937	605	6.8	36,465	.25
Oklahoma	92	279	591,194	29,148	4.9	330,291	1.79
Pennsylvania	84	130	16,713	1,229	7.4	41,848	.40
Texas	56	147	491,299	23,596	4.8	584,974	.84
West Virginia	35	112	63,328	4,151	6.6	155,065	.41
Wyoming	5	8	51,132	3,338	6.5	29,480	1.73
	[1] 350	1,035	2,210,494	128,160	5.8	2,088,778	1.06

[1] A producer operating in more than 1 State is counted only once.

[2] Less than $500.

Output by types of process.—The number of plants using the compression and charcoal processes continued to decline in 1930. The number of plants using the absorption process, or a combination of the absorption process and the compression or charcoal processes, also declined, the first such decline ever recorded. The major portion of the output continued to be produced by the absorption process, with the compression process next in importance and the charcoal process a poor third.

Natural gasoline produced in the United States, 1929 and 1930, by States and by methods of manufacture

State	Number of plants operating			Production (thousands of gallons)		
	Compression	Absorption including combination absorption process with compression and charcoal processes	Charcoal	Compression	Absorption including combination absorption process with compression and charcoal processes	Charcoal
1929						
Alaska		1			35	
Arkansas	1	11	2	2, 895	27, 702	2, 858
California	2	151		3, 238	837, 087	
Colorado		3			1, 630	
Illinois	78			7, 080		
Indiana	1			2		
Kansas	7	19		6, 379	29, 848	
Kentucky	3	4	2	94	5, 219	693
Louisiana	11	34	3	7, 835	55, 867	1, 255
New Mexico		1			1, 077	
New York	1	2		32	232	
Ohio	21	10	2	606	8, 995	1, 565
Oklahoma	111	181		144, 852	531, 178	
Pennsylvania	110	24	2	5, 145	12, 652	614
Texas	30	127	2	34, 392	384, 250	843
West Virginia	64	46	12	11, 488	44, 733	16, 773
Wyoming	2	6		34, 899	9, 645	
	442	620	25	258, 937	1, 950, 150	24, 601
1930						
Alaska		1			39	
Arkansas	1	11	2	2, 614	25, 641	2, 382
California	2	146		3, 033	826, 680	
Colorado		2			1, 322	
Illinois	80			6, 867		
Indiana	1			2		
Kansas	7	17		6, 912	28, 194	
Kentucky	2	3	1	98	5, 923	620
Louisiana	11	33	3	6, 818	66, 019	856
New Mexico		3			3, 663	
New York	1	2		21	187	
Ohio	21	7	2	670	7, 016	1, 251
Oklahoma	95	184		120, 460	470, 734	
Pennsylvania	106	22	2	5, 544	10, 518	651
Texas	30	116	1	43, 177	447, 523	599
West Virginia	63	40	9	12, 622	39, 330	11, 376
Wyoming	2	6		41, 641	9, 491	
	422	593	20	250, 479	1, 942, 280	17, 735

Output by months.—The production of natural gasoline in 1930 reached its peak during February, when the daily average output amounted to 6,480,000 gallons. Except for a brief period of increased output in October and November, the trend of production was consistently downward from February until the end of the year.

Summary of monthly natural-gasoline statistics in the United States in 1930, by months, in millions of gallons

	January	February	March	April	May	June	July	August	September	October	November	December	The year
Production by fields:													
Appalachian	11.0	9.3	9.9	8.2	6.8	6.1	5.1	5.0	4.8	7.0	7.6	8.4	89.2
Kentucky, Illinois, and Indiana	1.5	1.4	1.4	1.2	1.1	.9	.8	.9	.9	1.1	1.1	1.2	13.5
Oklahoma—													
Oklahoma City	1.9	1.7	2.4	3.1	3.8	4.0	2.7	2.9	4.0	4.4	3.6	3.8	38.3
Osage County	6.3	6.0	6.8	6.8	6.2	6.2	6.3	6.4	6.4	6.4	6.1	6.3	76.2
Seminole	23.9	22.1	24.5	25.4	25.2	25.2	21.8	19.2	18.3	18.6	16.9	16.4	257.5
Rest of State	18.9	18.5	20.8	19.5	19.8	18.5	18.1	17.6	17.2	18.3	16.0	16.0	219.2
Total Oklahoma	51.0	48.3	54.5	54.8	55.0	53.9	48.9	46.1	45.9	47.7	42.6	42.5	591.2
Kansas	2.8	3.0	3.0	3.3	3.3	2.9	2.6	2.5	2.5	3.2	3.1	2.9	35.1
Texas—													
North Texas	3.4	3.6	3.9	3.6	3.8	3.5	3.7	3.6	3.4	3.6	3.7	3.8	43.6
Panhandle	19.1	18.3	20.4	20.7	22.0	18.9	20.6	22.6	21.7	21.8	22.1	22.2	250.4
West central	11.6	11.9	12.5	12.5	12.6	12.7	12.6	12.3	12.1	12.8	12.3	12.1	148.0
Rest of State	3.3	3.1	3.6	3.6	3.8	3.6	3.7	3.7	4.6	5.5	5.9	4.9	49.3
Total Texas	37.4	36.9	40.4	40.4	42.2	38.7	40.6	42.2	41.8	43.7	44.0	43.0	491.3
Louisiana	8.0	6.3	7.8	6.3	6.3	5.9	5.8	5.7	5.6	6.1	5.0	4.9	73.7
Arkansas	2.3	2.3	2.6	2.6	2.7	2.7	2.6	2.7	2.5	2.6	2.5	2.5	30.6
Rocky Mountain	3.2	3.8	4.4	4.5	4.6	4.6	4.6	4.7	4.8	5.2	5.7	6.1	56.2
California—													
Huntington Beach	3.5	3.3	2.8	2.7	2.7	2.7	2.7	2.7	2.6	2.5	2.5	2.3	33.0
Kettleman Hills	8.8	8.2	9.8	12.5	14.4	13.6	14.1	14.8	13.5	13.2	17.1	15.3	155.3
Long Beach	15.3	14.8	15.3	14.8	14.9	13.9	14.9	15.4	14.7	15.3	14.5	14.7	178.5
Santa Fe Springs	21.5	21.0	21.5	16.8	17.4	15.7	16.4	16.3	15.6	16.0	15.1	14.6	207.9
Seal Beach	3.2	3.0	2.7	2.5	2.3	2.1	2.0	2.0	2.0	1.8	1.6	1.6	26.8
Ventura Avenue	6.2	6.3	5.5	5.2	5.5	5.4	5.7	5.7	5.3	5.7	5.6	5.9	68.0
Rest of State	12.6	13.5	13.7	13.4	13.8	13.2	14.1	13.3	11.9	13.9	13.3	13.5	160.2
Total California	71.1	70.1	71.3	67.9	71.0	66.6	69.9	70.2	65.6	68.4	69.7	67.9	829.7
Total United States	188.3	181.4	195.3	189.2	193.0	182.3	180.9	180.0	174.4	185.0	181.3	179.4	2,210.5
Daily average	6.1	6.5	6.3	6.3	6.2	6.1	5.8	5.8	5.8	6.0	6.0	5.8	6.1
Stocks at end of period	25.7	24.0	28.3	29.8	38.7	39.0	31.1	31.3	22.4	23.5	25.0	24.3	24.3
Indicated deliveries	188.0	183.1	191.0	187.7	184.1	182.0	188.8	179.8	183.3	183.9	179.8	180.1	2,211.6
Blending at plants:													
Natural gasoline used [1]	1.3	.9	1.1	1.0	.9	.9	.9	.8	.7	.7	.7	.7	10.6
Naphtha used [1]	1.6	.8	.9	.9	1.0	1.1	1.1	.9	1.0	.9	.8	.7	11.7
Stocks of blends at end of period	.6	.5	.5	.6	.5	.5	.5	.5	.5	.5	.6	.5	.5

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[1] Exclusive of California.

Output by counties.—During 1930 natural gasoline was produced in 157 counties in 16 States, the same number of producing States but a decline of 4 counties as compared with 1929. Although the output of Los Angeles County, Calif., declined materially in 1930, it easily retained first place among the producing counties. Seminole County, Okla., was again second; but Ventura County, Calif., which ranked third in 1929, fell to eighth. Gray County, in the Texas Panhandle, more than doubled its output in 1930 and rose to third from ninth in 1929. Other important producing counties were Hutchinson, Tex., Creek and Osage, Okla., and Fresno and Kings, Calif.

Natural gasoline produced in the United States in 1930, by States and by counties

State	County	Thousands of gallons	Thousands of dollars
Alaska	Third division	39	5
Arkansas	Ouachita	7,093	407
	Union	23,544	1,350
		30,637	1,757
California	Fresno and Kings	155,262	9,351
	Kern	54,358	5,025
	Los Angeles	453,847	31,923
	Orange	68,059	4,816
	Santa Barbara	26,348	1,785
	Ventura	71,839	5,074
		829,713	57,974
Colorado	Larimer	1,322	69
Illinois	Clark and Cumberland	512	24
	Crawford	2,360	145
	Lawrence	3,995	251
		6,867	420
Indiana	Pike	2	(1)
Kansas	Barber, McPherson, and Montgomery	3,231	93
	Butler and Sedgwick	10,238	508
	Chautauqua	210	11
	Cowley	6,593	345
	Greenwood	10,812	458
	Sumner	4,022	155
		35,106	1,570
Kentucky	Boyd, Martin, and Wayne	5,441	321
	Clark and Lee	1,200	64
		6,641	385
Louisiana	Bossier, DeSoto, and Red River	2,841	135
	Caddo	7,506	409
	Claiborne	11,052	584
	Morehouse	2,298	107
	Ouachita	7,323	337
	Richland	22,121	1,116
	Webster	20,552	1,037
		73,693	3,725
New Mexico	Eddy and Lea	3,663	169
New York	Allegany	208	19
Ohio	Cuyahoga, Medina, and Wayne	1,252	88
	Fairfield, Hocking, and Meigs	1,676	104
	Guernsey, Jefferson, and Noble	382	24
	Licking and Richland	4,429	298
	Monroe	484	35
	Washington	714	56
		8,937	605

[1] Less than $500.

Natural gasoline produced in the United States in 1930, by States and by counties—Continued

State	County	Thousands of gallons	Thousands of dollars
Oklahoma	Beckham, Custer, and Harmon	4,687	220
	Carter	11,260	498
	Creek	77,039	3,804
	Garfield	9,066	453
	Grady, Pontotoc, and Stephens	1,019	49
	Hughes	6,064	293
	Kay	16,569	891
	Lincoln	6,076	289
	Logan	9,149	562
	Muskogee	884	47
	Noble	11,533	412
	Nowata	799	33
	Okfuskee	9,684	473
	Oklahoma	38,326	1,810
	Okmulgee	6,975	362
	Osage	76,237	3,772
	Pawnee	4,556	227
	Payne	5,323	261
	Pottawatomie	44,415	2,516
	Seminole	244,131	11,788
	Tulsa and Wagoner	6,206	327
	Washington	1,196	61
		591,194	29,148
Pennsylvania	Allegheny	1,734	124
	Armstrong and Lawrence	80	6
	Beaver	161	12
	Butler	550	38
	Clarion	440	40
	Crawford	164	10
	Elk and Potter	427	24
	Forest	591	42
	Greene	4,558	315
	McKean	1,486	129
	Venango	3,303	264
	Warren	2,351	164
	Washington	868	61
		16,713	1,229
Texas	Anderson, Navarro, and Van Zandt	8,340	403
	Archer, Clay, and Jack	7,612	393
	Austin, Caldwell, Harrison, and Panola	6,119	318
	Brown	7,382	438
	Carson	19,525	987
	Coleman and Comanche	3,401	84
	Cooke and Wilbarger	6,169	304
	Crane, Ector, Pecos, and Reagan	44,788	2,083
	Eastland	57,970	2,664
	Erath and Palo Pinto	9,694	389
	Gray	127,439	6,198
	Howard, Jones, Mitchell, and Shackelford	8,878	299
	Hutchinson	86,828	4,335
	Moore and Potter	7,744	322
	Stephens	45,870	2,175
	Wheeler	8,831	420
	Wichita	27,840	1,446
	Young	6,869	338
		491,299	23,596
West Virginia	Brooke and Marshall	747	43
	Cabell, Lincoln, and Wayne	2,139	131
	Calhoun, Gilmer, and Wirt	319	21
	Clay and Doddridge	649	39
	Harrison	2,668	198
	Jackson	5,312	328
	Kanawha	25,595	1,574
	Lewis	4,515	323
	Marion	2,617	186
	Monongalia	671	41
	Pleasants	913	70
	Ritchie	801	53
	Roane	2,857	180
	Tyler	2,044	144
	Wetzel	11,481	820
		63,328	4,151
Wyoming	Carbon, Fremont, Hot Springs, and Niobrara	3,038	193
	Natrona	48,094	3,145
		51,132	3,338
United States		2,210,494	128,160

World production.—According to a survey conducted by Swanson,[2] the world production of natural gasoline increased from 1,977,960,000 gallons in 1928 to 2,446,401,000 gallons in 1929, a gain of 23.7 per cent. Of the 1929 total the United States produced 2,233,688,000 gallons (91.3 per cent), leaving 212,713,000 gallons (8.7 per cent) produced by foreign countries. Although these figures indicate that the United States is still far in the lead in natural-gasoline production, the output of the other countries is becoming increasingly important. Of the 212,713,000 gallons reported for foreign countries in 1929, approximately 84,000,000 gallons were mixed with crude and transported from producing properties, the quantity of natural-gasoline production being included in the figures of crude-oil production; the remaining quantity was transported separately by pipe line, tanker, or tank car to refineries for blending with naphthas in the production of motor fuel. Aside from the United States, natural-gasoline production was reported for 16 countries—Netherland East Indies, Rumania, Peru, Persia, Russia (U. S. S. R.), Venezuela, Colombia, Poland, Mexico, Argentina, British India, Japan, British Borneo, Egypt, Taiwan, and Trinidad. A limited production was reported for Canada in 1927 and 1928 but none for 1929. Among the countries to which inquiries were sent and which reported that no natural gasoline was being produced were Brazil, Czechoslovakia, Ecuador, Estonia, France, Germany, and Italy. It was reported also that a small quantity of natural gasoline had been produced in Australia but not to the extent of a commercial operation.

Of the production reported for the Netherland East Indies during 1929 approximately 25,000,000 gallons were mixed with crude; the balance was transported to refineries for blending in the production of motor fuel. All of the production reported for Peru was transported by pipe line to Talara for blending with the gasoline produced at the refinery. Of the 1929 output of 30,500,000 gallons, 27,015,000 gallons were reported as the production of gasoline plants at La Brea and Parinas and 3,485,000 gallons as the production from Lobitos. All of the Persian production is blended with crude in the field and transported by pipe line to the Abadan refinery. In Rumania, Russia, Poland, Mexico, Japan, and Taiwan natural gasoline is handled almost entirely apart from crude oil.

All of the Colombian production and almost all of that in Venezuela is mixed with crude oil, but the Argentine production is shipped by rail or boat to refineries. In British India some of the natural-gasoline output is handled separately by pipe line, and the remainder is turned into crude-oil pipe lines. The natural gasoline produced in Sarawak is transported by pipe line to the refinery. All of the Egyptian production is mixed with crude oil at Hurghada and shipped to the refinery at Suez. Of the 162,288 gallons reported for Trinidad, 129,570 gallons were mixed with crude and 32,718 gallons were marketed directly as motor fuel.

Statistics of natural-gasoline production in 1930 were available for all but three foreign countries as this chapter went to press. These data indicate that the world production of natural gasoline in 1930 was about 1.5 per cent above 1929. This increase resulted solely from the gain in production outside of the United States; the proportion of the total that is produced within the United States accordingly fell from 91.3 per cent to about 90 per cent.

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[2] Swanson, E. B., World Production of Natural Gasoline: Press statement, Bureau of Mines, Feb. 28, 1931.

World production of natural gasoline, 1927–1930, by countries, in thousands of gallons

Country	1927	1928	1929	1930
United States	1, 641, 144	1, 814, 034	2, 233, 688	2, 210, 494
Netherland East Indies	32, 724	44, 611	56, 025	75, 035
Rumania	8, 958	12, 120	17, 805	36, 243
Peru	17, 453	26, 940	30, 500	32, 040
Persia	7, 984	19, 333	29, 263	28, 468
Russia	7, 804	9, 786	15, 162	22, 344
Venezuela	3, 508	10, 538	13, 094	17, 394
Colombia	3, 255	10, 284	13, 833	16, 432
Poland	11, 086	12, 710	13, 767	15, 359
Mexico	3, 556	3, 404	4, 956	7, 190
Argentina	881	3, 460	5, 982	7, 158
India, British	3, 348	4, 401	4, 195	(1)
Japan	2, 848	2, 835	3, 248	(1)
British Borneo (Sarawak)	952	2, 047	3, 202	3, 479
Egypt	708	903	889	1, 109
Taiwan (Formosa)	211	547	630	(1)
Trinidad	----------	----------	162	253
Canada	258	7	----------	----------
	1, 746, 678	1, 977, 960	2, 446, 401	2, 472, 998

[1] Figures not yet available.

CONSUMPTION

Summary.—Of the total output of natural gasoline in 1930—2,210,494,000 gallons—1,743,042,000 gallons (78.9 per cent) were blended at refineries; 70,098,000 gallons (3.2 per cent) were run through pipe lines in California; 10,621,000 gallons (0.5 per cent) were blended at plants east of California; 232,890,000 (10.5 per cent) were estimated as exported and sold to jobbers; and 3,658,000 gallons (0.1 per cent) were added to stocks. A balance of 150,185,000 gallons (6.8 per cent) remained for losses, quantities not accounted for, and the relatively small amounts run through pipe lines east of California and blended at plants in California. Similar data for 1929 are not available for all of the items, but the most important change in 1930 was a gain in the relative importance of the total exported and sold to jobbers. (See fig. 6.)

Blending at refineries.—The refineries, the largest consumers of natural gasoline, used 1,743,042,000 gallons of natural gasoline in blending in 1930, besides 88,028,000 gallons which were turned into pipe lines and eventually run to stills with crude or other oils, making a total refinery utilization of 1,831,070,000 gallons. The year brought a decline in blending of natural gasoline at the refineries along the Atlantic seaboard which, together with a probable gain in shipments of natural gasoline from California to that district, deprived the Mid-Continent producers of a portion of their market and forced them to dispose of more locally or to plants in contiguous districts. Thus, the amounts of natural gasoline blended in Kansas, Oklahoma, and Texas increased materially in 1930, although the total output of these three States registered a small decrease. On the basis of the percentage of natural gasoline utilized to the total output of motor fuel, the California district easily ranks first; the East coast district is last. The fact that the East coast ranks first and California last in the percentage of motor fuel produced by the cracking process illustrates the close relationship between the expansion of cracking and the blending of natural gasoline.

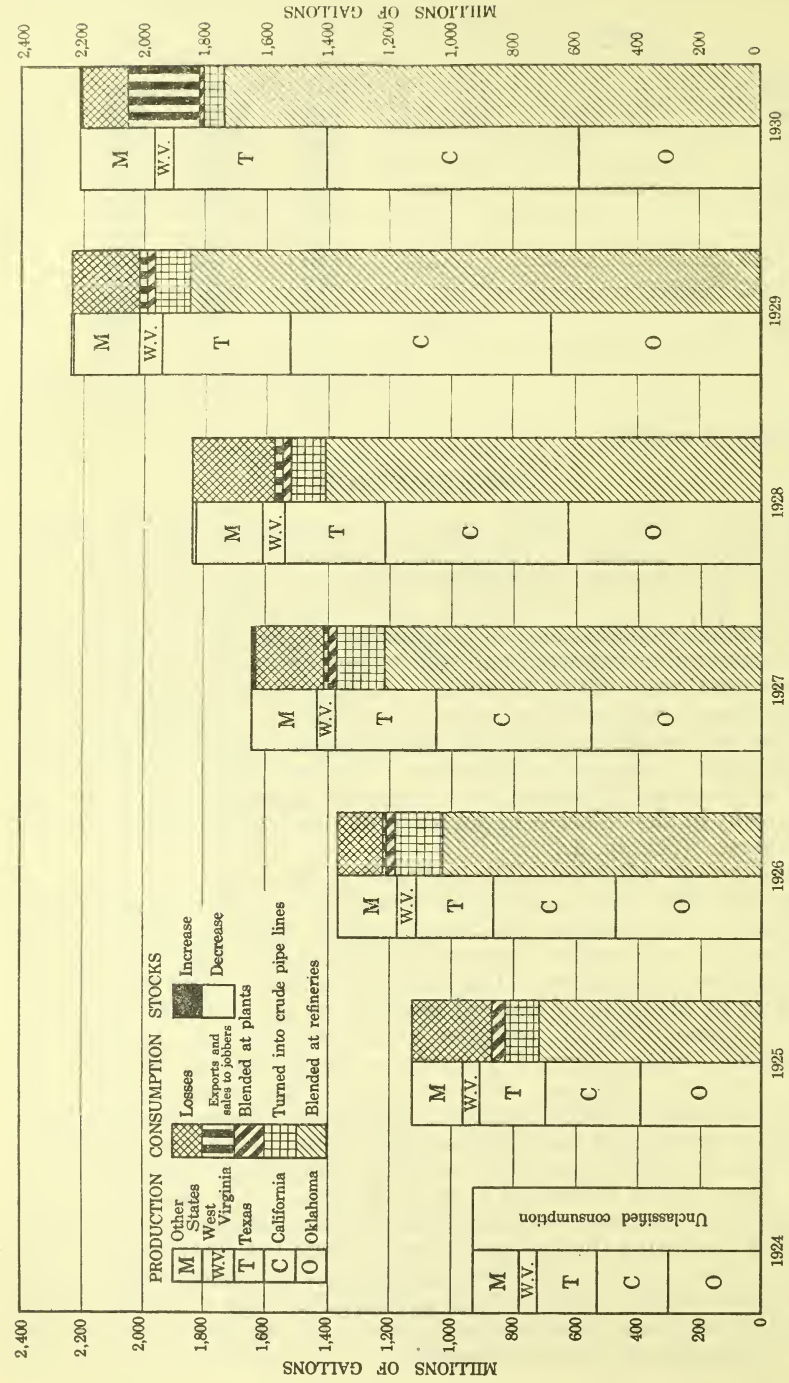

FIGURE 6.—Production and consumption of natural gasoline, 1924-1930

Distribution of natural gasoline in 1930, by months, in thousands of gallons

	January	February	March	April	May	June	July	August	September	October	November	December	The year
Production	188,300	181,400	195,294	189,200	193,000	182,300	180,900	180,000	174,400	185,000	181,300	179,400	2,210,494
Decrease in all stocks						1,069		13,932	19,794	7,474		90	
	188,300	181,400	195,294	189,200	193,000	183,369	180,900	193,932	194,194	192,474	181,300	179,490	2,210,494
Blended at refineries	136,752	133,980	135,618	143,052	132,804	136,500	154,602	152,544	164,976	157,332	146,622	148,260	1,743,042
Run through pipe line in California	9,828	6,006	10,710	8,148	8,610	4,662	4,410	4,074	4,032	3,276	3,276	3,066	70,098
Blended at plants [1]	1,307	851	1,058	1,049	896	946	944	769	739	737	662	663	10,621
Exports and sales to jobbers	13,986	18,354	19,824	23,478	19,992	24,066	11,256	27,762	13,902	20,496	21,084	18,690	232,890
Increase in all stocks	9,759	8,820	7,524	1,426	16,426		1,053				1,009		3,658
Balance	16,668	13,389	20,560	12,047	14,272	17,195	8,635	8,783	10,545	10,633	8,647	8,811	150,185
	188,300	181,400	195,294	189,200	193,000	183,369	180,900	193,932	194,194	192,474	181,300	179,490	2,210,494

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[1] East of California.

Natural gasoline blended at refineries in the United States, 1929 and 1930, by months, in thousands of gallons

	January	February	March	April	May	June	July	August	September	October	November	December	The year
1929													
East coast	9, 156	14, 280	7, 434	12, 096	9, 702	3, 570	3, 822	9, 828	5, 544	6, 888	8, 148	13, 398	103, 866
Appalachian	3, 192	2, 562	2, 100	1, 470	1, 302	1, 932	2, 016	1, 932	2, 142	2, 310	3, 066	2, 940	26, 964
Indiana, Illinois, Kentucky, etc	7, 896	6, 006	6, 762	6, 846	7, 392	7, 980	9, 156	8, 820	8, 442	15, 204	14, 070	12, 138	110, 712
Oklahoma, Kansas, and Missouri	12, 600	10, 668	11, 802	12, 180	13, 188	14, 700	16, 716	17, 934	16, 254	18, 060	17, 094	17, 220	178, 416
Texas:													
Gulf coast	24, 906	23, 940	30, 702	26, 880	25, 326	22, 260	21, 882	25, 242	34, 104	38, 178	25, 074	25, 074	323, 568
Rest of State	4, 326	4, 242	5, 334	5, 712	6, 636	6, 552	6, 636	8, 694	9, 072	9, 828	9, 114	9, 744	85, 890
Total Texas	29, 232	28, 182	36, 036	32, 592	31, 962	28, 812	28, 518	33, 936	43, 176	48, 006	34, 188	34, 818	409, 458
Louisiana-Arkansas:													
Louisiana Gulf coast	15, 666	14, 406	23, 184	19, 320	21, 210	18, 186	16, 968	18, 186	16, 380	20, 034	16, 212	18, 480	218, 232
Northern Louisiana and Arkansas	4, 284	3, 990	4, 872	4, 410	5, 292	5, 250	5, 964	6, 132	6, 468	6, 426	6, 636	4, 746	64, 470
Total Louisiana and Arkansas	19, 950	18, 396	28, 056	23, 730	26, 502	23, 436	22, 932	24, 318	22, 848	26, 460	22, 848	23, 226	282, 702
Rocky Mountain	3, 990	4, 410	5, 418	5, 334	5, 670	5, 460	5, 460	5, 460	5, 796	5, 586	4, 914	5, 166	62, 664
California	47, 082	43, 554	61, 194	51, 366	49, 434	52, 374	59, 808	60, 732	62, 328	71, 610	52, 248	64, 848	676, 578
Total United States	133, 098	128, 058	158, 802	145, 614	145, 152	138, 264	148, 428	162, 960	166, 530	194, 124	156, 576	173, 754	1, 851, 360
1930													
East coast	10, 668	11, 424	8, 022	9, 114	5, 796	5, 628	6, 174	4, 452	5, 376	8, 190	9, 030	9, 492	93, 366
Appalachian	2, 520	1, 932	1, 470	1, 470	1, 680	1, 848	2, 268	1, 764	2, 940	3, 066	2, 100	1, 722	24, 780
Indiana, Illinois, and Kentucky	12, 474	8, 778	8, 652	9, 282	8, 862	8, 778	9, 702	9, 996	11, 004	11, 466	12, 390	11, 466	122, 850
Oklahoma, Kansas, and Missouri	15, 372	15, 582	19, 110	19, 404	16, 212	15, 750	19, 446	18, 942	17, 262	19, 404	19, 278	17, 472	213, 234
Texas:													
Gulf coast	31, 458	30, 156	35, 406	36, 078	33, 600	33, 264	33, 306	36, 456	35, 658	35, 364	33, 432	35, 826	410, 004
Rest of State	7, 518	8, 862	9, 324	9, 660	10, 290	9, 534	11, 004	11, 424	11, 088	10, 668	10, 794	10, 164	120, 330
Total Texas	38, 976	39, 018	44, 730	45, 738	43, 890	42, 798	44, 310	47, 880	46, 746	46, 032	44, 226	45, 990	530, 334
Louisiana-Arkansas:													
Louisiana Gulf coast	13, 188	14, 196	11, 550	10, 668	8, 694	9, 240	8, 820	8, 652	7, 854	8, 190	7, 014	7, 098	115, 164
Northern Louisiana and Arkansas	4, 914	4, 536	5, 796	5, 628	5, 418	4, 074	4, 620	4, 914	5, 250	4, 830	4, 452	4, 116	58, 548
Total Louisiana and Arkansas	18, 102	18, 732	17, 346	16, 296	14. 112	13, 314	13, 440	13, 566	13, 104	13, 020	11, 466	11, 214	173, 712
Rocky Mountain	3, 612	4, 998	5, 964	5, 754	5, 208	5, 292	5, 460	5, 544	5, 838	6, 468	5, 124	5, 544	64, 806
California	35, 028	33. 516	30, 324	35, 994	37, 044	43, 092	53, 802	50, 400	62, 706	49, 686	43, 008	45, 360	519, 960
Total United States	136, 752	133, 980	135, 618	143, 052	132, 804	136, 500	154, 602	152, 544	164, 976	157, 332	146, 622	148, 260	1, 743, 042

Turned into pipe lines.—The transportation of natural gasoline to refineries by pipe lines apparently declined in 1930, as the amount transported fell to 88,028,000 gallons from 113,534,000 gallons in 1929. It is possible, however, that this decrease may be more theoretical than actual, as some companies report "natural gasoline utilized" as "natural gasoline blended," regardless of whether it came to them by pipe line or tank car. California, where 70,098,000 gallons of natural gasoline were handled in pipe lines in 1930, continued to rank first in this type of transportation. The quantity transported in lines east of California increased in 1930, but the total—17,930,000 gallons—was only about 1 per cent of the amount distributed.

The building of new lines to transport natural gasoline was virtually at a standstill in 1930. No long lines were laid, the only construction being that of short lines from the plants to refineries or loading racks.

Natural gasoline turned into crude-petroleum pipe lines in the United States, 1923–1930, by States, in thousands of gallons

State	1923	1924	1925	1926	1927	1928	1929	1930
Alaska			20	18	15	22	32	39
Arkansas				2, 188				
California	50, 398	87, 135	107, 771	138, 474	141, 500	80, 000	99, 834	70, 098
Colorado							222	
Illinois	26			12	3	4		
Kansas				243	3, 172	5, 050	2, 471	48
Kentucky				1				
Louisiana	3, 049	373	136		72			
Oklahoma	15, 418	1, 640	2, 065	8, 472	5, 701	8, 093	4, 270	3, 538
Pennsylvania	252						2	
Texas	3, 529	347	171	91	1, 658	13, 361	6, 659	13, 887
West Virginia	25				10			404
Wyoming	1, 838			47	548	86	44	14
	74, 535	89, 495	110, 163	149, 546	152, 679	106, 616	113, 534	88, 028

Blending at plants.—Some manufacturers buy naphtha from refiners to blend with raw natural gasoline in the production of finished motor fuel, but this practice declined drastically in 1930, after remaining practically unchanged in 1928 and 1929. The quantity of natural gasoline used in motor blends at natural-gasoline plants fell from 27,569,000 gallons in 1929 to 10,621,000 gallons in 1930; the amount of naphtha blended in 1930 amounted to 11,748,000 gallons, or little more than one-third of the 1929 total. The fall in the price of natural gasoline in 1930 was instrumental in centering the attention of the manufacturers on finding new outlets for their product; however, the possibility of utilizing a material portion of the output to blend with naphtha purchased from refiners in the production of a finished motor fuel became increasingly remote as the price of motor fuel dropped to approximately that of naphtha. The possibility of producing naphtha at the plants by topping crude (which assumed some importance in 1931, due to low crude prices) became an actuality in only a few isolated cases.

Natural gasoline and naphtha used in motor blends at natural-gasoline plants in the United States (east of California), 1929 and 1930, by districts and months, in thousands of gallons

	January	February	March	April	May	June	July	August	September	October	November	December	The year
1929													
Natural gasoline:													
Appalachian	82	80	93	92	109	84	79	83	78	83	84	81	1,028
Indiana, Illinois, Kentucky, etc.	1	1	1		1		1	1				1	7
Oklahoma-Kansas	1,634	1,205	1,250	1,689	1,859	1,831	2,163	1,951	1,701	1,284	1,196	1,059	18,822
Texas	353	327	340	413	389	419	358	389	470	341	411	441	4,651
Louisiana-Arkansas	185	223	309	264	292	288	258	240	251	259	251	241	3,061
	2,255	1,836	1,993	2,458	2,650	2,622	2,859	2,664	2,500	1,967	1,942	1,823	27,569
Naphtha:													
Appalachian	125	124	105	91	119	131	119	124	99	110	107	94	1,348
Indiana, Illinois, Kentucky, etc.	1	2	1	2	2	1	1	1	1	1		2	15
Oklahoma-Kansas	1,790	1,373	1,361	2,106	2,332	1,927	2,012	1,956	1,730	1,381	1,170	875	20,013
Texas	428	446	495	617	534	569	573	499	592	606	851	778	6,988
Louisiana-Arkansas	262	294	482	401	393	362	296	293	275	330	330	251	3,969
	2,606	2,239	2,444	3,217	3,380	2,990	3,001	2,873	2,697	2,428	2,458	2,000	32,333
1930													
Natural gasoline:													
Appalachian	75	79	77	84	93	88	83	83	81	86	72	72	973
Indiana, Illinois, and Kentucky	1			1	2	1				1			6
Oklahoma-Kansas	621	391	581	555	420	374	410	204	185	172	154	149	4,216
Texas	393	161	161	187	169	257	213	240	240	248	220	238	2,727
Louisiana-Arkansas	217	220	239	222	212	226	238	242	233	230	216	204	2,699
	1,307	851	1,058	1,049	896	946	944	769	739	737	662	663	10,621
Naphtha:													
Appalachian	78	88	96	116	134	103	129	107	126	118	88	87	1,270
Indiana, Illinois, and Kentucky	1	1	1	1	1	1	1		1	1			9
Oklahoma-Kansas	664	204	273	287	314	316	274	195	172	146	150	122	3,117
Texas	624	260	255	284	338	467	427	407	402	412	363	342	4,581
Louisiana-Arkansas	258	234	283	236	218	227	231	225	270	208	208	173	2,771
	1,625	787	908	924	1,005	1,114	1,062	934	971	885	809	724	11,748

Exports and sales to jobbers.—Although complete figures are not available it is believed that there was a material growth in exports of natural gasoline in 1930, due partly to the desire of manufacturers to find new outlets and partly to changes in the motor-fuel markets abroad. The export trade in natural gasoline has been stimulated by the growth in stabilization, as stabilized natural gasoline is easier to ship and in quality comes closer to the specifications of European buyers than the unstabilized product. Figures of exports of natural gasoline are available only for California. These show total shipments to foreign countries in 1930 of 106,848,000 gallons, or the equivalent of 13 per cent of the production in that State. Although some of the exports from California are consigned to Pacific ports the major portion travels to foreign countries bordering on the Atlantic via the Panama Canal and is thus brought into direct competition with natural and refined gasoline produced east of the Rockies.

The natural-gasoline manufacturers east of California not only face competition with California natural gasoline in foreign markets but must also compete with natural gasoline shipped from California to refineries on the Atlantic seaboard and on the Gulf of Mexico. Such shipments totaled 71,946,000 gallons in 1930 and comprised a material portion of what was formerly considered the business of the Mid-Continent and Appalachian producers.

There is probably no large natural-gasoline producer who has not given serious thought to the possibility of disposing of all, or at least the major part, of his output directly to the motor-fuel consumers. Stabilization, removing the lighter ends of natural gasoline (propane and butane), has greatly improved the performance of straight natural gasoline in engines, particularly as regards vapor rock; however, the removal of propane and butane lowers the antiknock rating to a point considerably below the accepted standard for the best motor fuels. Despite this and other handicaps experienced in meeting the present motor-fuel specifications the sale of natural gasoline to jobbers has increased steadily in recent years. In 1930 such sales were estimated to amount to 63,000,000 gallons. It appears quite certain, however, that the refiners will continue to be the chief consumers of natural gasoline; in fact, they are beginning to realize that unless they supply an outlet for natural gasoline it will compete with and perhaps undersell their own motor fuel.

STOCKS

Stocks of natural gasoline held at the plants on December 31, 1930, amounted to 24,316,000 gallons, a decline of about 1,000,000 gallons from the previous year. Stocks of natural gasoline held by refiners, for which data were made available in 1930 for the first time, amounted to 75,558,000 gallons at the close of the year, a decline of nearly 5,000,000 gallons from the previous year. Total stocks at the close of 1930 amounted to 99,874,000 gallons, or approximately 17 days' supply. The trend in stocks of natural gasoline held by plant operators in 1930 lacked the fluctuations of 1929, which indicates little tendency to follow the suggestion that the producers construct storage facilities to take care of the "distress" product. The principal obstacle to this plan appears to be that, in general, companies that are in a position to construct additional storage are not the ones that consistently undersell the market. At the close of 1930 California held nearly 60 per cent of all of the natural gasoline in storage, and for September, 1930, the proportion was as high as 68 per cent.

Stocks of natural gasoline held at plants in the United States at the end of each month of 1930, by refining districts, by States, and by selected fields, in thousands of gallons

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Appalachian:												
New York	------	------	------	------	21	21	21	21	21	21	28	18
Ohio	331	227	252	277	233	153	244	126	128	200	173	187
Pennsylvania	930	938	1,217	1,317	1,242	1,205	941	831	690	672	841	755
West Virginia	2,150	2,070	2,993	2,734	3,443	3,482	2,066	1,611	1,133	1,704	1,840	2,005
	3,411	3,235	4,462	4,328	4,939	4,861	3,272	2,589	1,972	2,597	2,882	2,965
Indiana, Illinois, and Kentucky:												
Illinois	172	188	172	159	165	208	175	183	150	159	195	202
Kentucky	232	243	321	371	422	418	311	71	45	48	62	40
	404	431	493	530	587	626	486	254	195	207	257	242
Oklahoma-Kansas:												
Kansas	535	816	999	969	1,530	1,518	1,242	1,173	832	709	809	947
Oklahoma—												
Oklahoma City	196	284	698	479	859	670	1,380	721	843	924	862	1,077
Osage County	2,721	2,044	2,335	4,060	4,606	4,913	5,225	5,183	2,475	2,474	1,680	1,715
Seminole	2,395	2,332	2,515	2,248	3,903	4,410	2,303	2,574	1,759	2,290	2,202	2,323
Rest of State	5,314	5,429	5,743	4,685	7,336	7,310	4,879	5,017	4,046	3,570	3,454	3,370
	10,626	10,089	11,291	11,472	16,704	17,303	13,787	13,495	9,123	9,258	8,198	8,485
	11,161	10,905	12,290	12,441	18,234	18,821	15,029	14,668	9,955	9,967	9,007	9,432
Texas:												
Panhandle	3,071	2,295	2,812	3,860	4,945	4,841	4,148	5,497	3,038	3,720	4,586	3,501
North Texas	1,006	975	1,235	1,196	1,397	1,062	878	888	631	712	867	933
West central	2,520	2,425	3,071	3,603	4,572	4,454	3,402	3,567	2,957	2,192	2,238	2,630
Rest of State	550	421	465	457	652	657	516	524	478	766	1,198	944
	7,147	6,116	7,583	9,116	11,566	11,014	8,944	10,476	7,104	7,390	8,889	8,008
Louisiana-Arkansas:												
Arkansas	246	247	291	361	337	270	231	273	278	329	301	347
Louisiana	1,030	809	986	635	709	795	653	710	626	808	802	739
	1,276	1,056	1,277	996	1,046	1,065	884	983	904	1,137	1,103	1,086
Rocky Mountain:												
Colorado	15	13	13	12	12	9	11	5	9	5	10	12
New Mexico	40	67	75	98	130	162	172	170	56	216	428	331
Wyoming	529	489	542	488	533	592	507	514	513	512	497	433
	584	569	630	598	675	763	690	689	578	733	935	776
California	1,688	1,721	1,546	1,782	1,610	1,824	1,818	1,602	1,721	1,450	1,963	1,807
United States	25,671	24,033	28,281	29,791	38,657	38,974	31,123	31,261	22,429	23,481	25,036	24,316

Stocks of natural gasoline held at refineries in the United States at the end of each month of 1930, by refining districts, in thousands of gallons

District	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
East coast	4,956	5,628	3,486	3,066	3,360	3,486	4,368	6,090	4,116	1,428	546	5,082
Appalachian	378	462	462	630	546	420	378	252	252	420	504	504
Indiana, Illinois, and Kentucky	2,058	1,764	1,302	1,176	1,764	1,596	1,848	1,050	1,554	1,764	2,016	1,638
Oklahoma-Kansas	2,352	1,554	2,016	714	420	714	714	504	672	798	588	294
Texas	10,164	10,122	7,812	7,518	3,864	5,292	11,760	4,074	5,880	10,962	11,802	10,668
Louisiana-Arkansas	1,386	798	1,134	798	756	630	630	504	756	924	630	588
Rocky Mountain	210	252	168	336	126	84	42	42	42	84	84	42
California	58,800	70,182	77,658	79,716	90,678	87,906	89,292	82,446	70,728	59,094	58,758	56,742
	80,304	90,762	94,038	93,954	101,514	100,128	109,032	94,962	84,000	75,474	74,928	75,558

Total stocks of natural gasoline held in the United States at the end of each month of 1930, by refining districts, in thousands of gallons

District	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
East coast	4,956	5,628	3,486	3,066	3,360	3,486	4,368	6,090	4,116	1,428	546	5,082
Appalachian	3,789	3,697	4,924	4,958	5,485	5,281	3,650	2,841	2,224	3,017	3,386	3,469
Indiana, Illinois, and Kentucky	2,462	2,195	1,795	1,706	2,351	2,222	2,334	1,304	1,749	1,971	2,273	1,880
Oklahoma-Kansas	13,513	12,459	14,306	13,155	18,654	19,535	15,743	15,172	10,627	10,765	9,595	9,726
Texas	17,311	16,238	15,395	16,634	15,430	16,306	20,704	14,550	12,984	18,352	20,691	18,676
Louisiana-Arkansas	2,662	1,854	2,411	1,794	1,802	1,695	1,514	1,487	1,660	2,061	1,733	1,674
Rocky Mountain	794	821	798	934	801	847	732	731	620	817	1,019	818
California	60,488	71,903	79,204	81,498	92,288	89,730	91,110	84,048	72,449	60,544	60,721	58,549
	105,975	114,795	122,319	123,745	140,171	139,102	140,155	126,223	106,429	98,955	99,964	99,874

As already stated, the practice of blending natural gasoline with purchased naphtha at the plants declined in 1930; consequently, the quantity of motor blends held by the operators tended to decrease. Stocks of blends held at the plants on December 31, 1930, totaled 485,000 gallons as compared with 676,000 gallons on hand at the end of the previous year and 1,224,000 gallons stored on December 31, 1928.

Stocks of motor blends held at natural-gasoline plants in the United States at the end of each month, 1929 and 1930, by districts, in thousands of gallons

District	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1929												
Appalachian	214	253	252	246	250	273	261	230	212	222	231	[1] 235
Indiana, Illinois, Kentucky, etc	8	9	11	11	12	12	11	10	10	9	7	9
Oklahoma-Kansas	472	539	343	468	543	593	608	571	619	395	294	[1] 223
Texas	128	164	140	225	152	168	175	123	154	190	154	145
Louisiana-Arkansas	27	79	36	50	37	50	32	21	52	36	23	64
California	11	4	12	------	------	------	------	------	------	------	------	------
	860	1,048	794	1,000	994	1,096	1,087	955	1,047	852	709	[1] 676
1930												
Appalachian	214	216	211	227	218	227	240	213	216	219	213	213
Indiana, Illinois, and Kentucky	10	9	9	8	9	9	8	6	5	4	------	------
Oklahoma-Kansas	166	150	118	183	146	131	118	108	114	96	149	138
Texas	216	106	111	116	98	139	101	142	144	174	153	110
Louisiana-Arkansas	20	33	31	24	28	23	26	36	33	25	44	24
	626	514	480	558	499	529	493	505	512	518	559	485

[1] Revised figures.

LIQUEFIED PETROLEUM GASES

As mentioned, the year witnessed material expansion in stabilization, with the result that the average yield of natural gasoline per thousand cubic feet of gas treated was lowered, but the quantity of material available for use by the liquefied petroleum-gas industry showed a corresponding increase. Accordingly, this industry recorded a material expansion in 1930, which has been outlined by Swanson [3] as follows:

> Marketed production of liquefied petroleum gases, principally propane and butane, during 1930 reached a total of 18,017,347 gallons, an increase of 81.4 per cent over the 9,930,964 gallons marketed during 1929 and nearly 300 per

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[3] Swanson, E. B., Production of Liquefied Petroleum Gases Increased in 1930: Press statement, Bureau of Mines, March 10, 1931.

cent greater than the 4,522,899 gallons marketed during 1928. The first survey of production, completed in June, 1930, reported the quantities marketed annually from 1922 to 1929, inclusive.

Marketed production of liquefied petroleum gases, 1922–1930

Year	Gallons
1922	222, 641
1923	276, 863
1924	376, 488
1925	403, 674
1926	465, 085
1927	1, 091, 005
1928	4, 522, 899
1929	[4] 9, 930, 964
1930	18, 017, 347

An approximate segregation of the gases marketed indicates that the 1930 distribution of propane was about 11,500,000 gallons, virtually twice the 1929 distribution, while the distribution of butane, isobutane, pentane, and butane-pentane mixtures used for comparable purposes reached a total of about 6,500,000 gallons, approximately 50 per cent more than during 1929.

Propane is a gas at atmospheric pressure and such temperatures as may ordinarily be met but may be liquefied under moderate pressure and transported in cylinders or other special containers. It is self-vaporizing at temperatures above minus 44° F. and is most widely used as a domestic fuel in territories not served by gas mains. The practice of transporting it in cylinders as a liquid and utilizing it as a gas has resulted in its common designation as "bottled gas." It is estimated that 117,000 customers were served with this fuel during 1930, as compared with 55,000 in 1929 and 20,000 in 1928. The indicated average annual consumption per installation was 98.6 gallons.

Pure butane is not ordinarily used in "bottled-gas" service, as temperatures frequently may be too low to permit the necessary vaporization. Butane consequently finds its market principally in industrial uses, where arrangements may be made to provide the desired pressure either mechanically or by heating. The outstanding development in the use of butane has been the establishment of central stations in communities too small to support a gas service of the ordinary manufactured or natural type. In these stations butane is mixed with air, and the resulting mixture is distributed and metered to consumers just as other gas consumers are served.

Butane and other liquefied petroleum gases also are being used to replace gas oil in carburetting gases of relatively low thermal value, as a base material for manufactured gases, for the recarburetion of gases to offset the loss of thermal value in high-pressure transmission systems, to meet peak-load conditions, and as a protection against interruptions of service. These gases also have been applied to a number of industrial purposes.

Although pentane is a liquid at ordinary temperatures, it was included in the survey to the extent that it was marketed for purposes similar to other gases. Individual gas systems, in which air is passed through the pentane container, supply a mixture of air and pentane, which is used to a considerable extent in individual dwellings. Approximate data relative to the distribution of pentane for this purpose indicate a substantial increase during 1930 in the number of installations of such gas systems.

The producers of liquefied petroleum gases operating during 1930 and reporting distribution to the Bureau of Mines were identical with those reporting for 1929. These producers were listed in connection with the Bureau of Mines press statement issued during June, 1930. Although a number of companies indicated an interest in the possibilities of producing liquefied petroleum gases no additional producers were reported. It is probable, however, that the number of local distributors of these gases increased. The increased number of inquiries received by the bureau indicates a growing interest in the production and distribution of these gases and in the development of additional services for liquefied petroleum gases.

A recent survey of liquefied petroleum-gas plants in the United States, made by the American Gas Association, shows that 59 plants were in operation on December 31, 1930. Of this number 52 were of the butane-air type, and 7 were designed to serve undiluted propane and butane. The growth in number of liquefied petroleum-gas plants in 1930 was fairly widespread, with the greatest development in the Pacific Coast States.

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[4] Revised figure.

PRICES AND VALUES

The natural gasoline produced in 1930 had a total value at the plants of $128,160,000, a decline of $30,250,000 (19 per cent) from 1929. The average value per gallon in 1930 was 5.8 cents, as compared with an average of 7.1 cents in 1929. The 1930 average represents the lowest value ever recorded since natural-gasoline statistics were first compiled (1911) and is only a fraction of the record value of 18.7 cents per gallon in 1920. The average posted price of grade A natural gasoline in Oklahoma in 1930 was 5.4 cents per gallon. The difference of 0.4 cent per gallon in favor of the average value as compared with the average posted price was due mainly to the fact that the posted price, which covers only one grade in Oklahoma, did not reflect the higher averages that prevailed in California, the leading producing State. To a smaller extent the difference was also due to the fact that some manufacturers made long-term contracts early in 1930 which, because of the late season decline in prices, turned out to be advantageous.

The record of spot prices for natural gasoline in 1930 indicates a material weakening in quotations over the year. The price for grade A natural gasoline in Oklahoma on January 1, 1930, was 6.25 cents per gallon, but at the end of the year the price had fallen to 3.5 cents per gallon, the lowest ever recorded. The price trend in 1930 was characterized by a number of fluctuations; for example, the price in May was higher than at the beginning of the year, and the price on October 1 was slightly below the quotation of January 1. These temporary stiffenings in price quotations of natural gasoline in 1930 undoubtedly reflected the decline in production. On the other hand, the decline in output in December to the lowest level of the year could not prevent prices from dropping to new low levels. As would be expected, there is a close relationship between the trend of prices of natural gasoline at the plants and that of gasoline at the refineries. In 1930 the price of U. S. motor gasoline in Oklahoma declined from 6.89 cents per gallon in the first week of January to 4 cents on December 31, a net drop of 2.89 cents per gallon. This drop compares closely with a net drop of 2.75 cents per gallon in the posted price of natural gasoline. In 1930, as noted, the production of natural gasoline was reduced, and stocks at the plants were drawn on, both factors usually conducive to an increase in price. That prices actually fell to new low levels indicates that the trend in prices of motor fuel exerts a greater influence over natural-gasoline prices than the conditions of supply and demand.

Spot price of Oklahoma natural gasoline, grade A, on specified dates, with monthly and yearly averages, 1929 and 1930, in cents per gallon

[Oil and Gas Journal]

Date	Cents	Date	Cents
1929		1930	
Jan. 1	8	Jan 1	6.25
Jan. 8	7.25	Jan. 7	5.5
Jan. 15	6.75	Jan. 14	5.25
Jan. 22	7.25	Jan. 21	5.25
Jan. 29	7.75	Jan. 28	5.63
Average	7.35	Average	5.55
Feb. 5	7.25	Feb. 4	5.63
Feb. 12	7.38	Feb. 11	5.5
Feb. 19	7.75	Feb. 18	5.5
Feb. 26	7.75	Feb. 25	5.5
Average	7.53	Average	5.54
Mar. 5	6.88	Mar. 4	5.5
Mar. 12	7.75	Mar. 11	5.5
Mar. 19	7.5	Mar. 18	5.63
Mar. 26	8	Mar. 25	5.75
Average	7.32	Average	5.58
Apr. 2	8	Apr. 1	5.75
Apr. 9	8	Apr. 8	5.75
Apr. 16	8	Apr. 15	6.5
Apr. 23	7.88	Apr. 22	6.5
Apr. 30	7.75	Apr. 29	6.5
Average	7.96	Average	6.15
May 7	7.63	May 6	6.5
May 14	7.25	May 13	6.5
May 21	6.75	May 20	6.5
May 28	7.75	May 27	6.38
Average	7.38	Average	6.48
June 4	7.5	June 3	6.13
June 11	7.5	June 10	6.13
June 18	7.63	June 17	6
June 25	7.25	June 24	5.5
Average	7.51	Average	5.97
July 2	7	July 1	5.25
July 9	7	July 8	4.25
July 16	6.13	July 15	4.25
July 23	6.25	July 22	4.5
July 30	6.25	July 29	4.75
Average	6.59	Average	4.58
Aug. 6	6.25	Aug. 5	5
Aug. 13	6.38	Aug. 12	5.5
Aug. 20	6.63	Aug. 19	5.5
Aug. 27	6.75	Aug. 26	5.5
Average	6.45	Average	5.29
Sept. 3	6.5	Sept. 2	5.5
Sept. 10	6.5	Sept. 9	5.5
Sept. 17	6.75	Sept. 16	5.75
Sept. 24	6.75	Sept. 23	6
Average	6.63	Sept. 30	6
Oct. 1	6.5	Average	5.69
Oct. 8	6.5	Oct. 7	6
Oct. 15	6.5	Oct. 14	5.75
Oct. 22	6.75	Oct. 21	5.25
Oct. 29	6.75	Oct. 28	4.75
Average	6.58	Average	5.61
Nov. 5	6.63	Nov. 4	4.5
Nov. 12	6.5	Nov. 11	4.5
Nov. 19	6.75	Nov. 18	4.63
Nov. 26	6.75	Nov. 25	4.63
Average	6.66	Average	4.58
Dec. 3	6.88	Dec. 2	4.25
Dec. 10	6.75	Dec. 9	4
Dec. 17	6.63	Dec. 16	3.75
Dec. 24	6.5	Dec. 23	3.5
Dec. 31	6.25	Average	3.86
Average	6.68		
Average for the year	7.05	Average for the year	5.4

SUMMARY OF NATURAL-GAS STATISTICS

Prior to 1930 the trends in the production of natural gas and natural gasoline were very similar, with the output of natural gasoline registering the larger annual increases owing to the growth in percentage recovery. In 1930, however, the output of natural gas rose to a new high record, but the output of natural gasoline registered its first annual decline since statistics were first compiled for 1911.

The total output of natural gas in 1930 totaled 1,943,421,000,000 cubic feet, an increase of 1.3 per cent over 1929. Exports to Canada and Mexico amounted to 1,798,000,000 cubic feet; imports from Canada, the first in recent years, totaled 21,000,000 cubic feet. Thus, the total consumption of natural gas within the United States in 1930 was 1,941,644,000,000 cubic feet. The quantity of natural gas treated for the recovery of natural gasoline in 1930 totaled 2,088,778,000,000 cubic feet, or 107 per cent of the production. This marks the second successive year in which the amount of gas treated has exceeded the amount produced. The excess was again due to the fact that in some States, particularly California and Texas, large quantities of gas were treated, but the residue gas was allowed to escape into the air for want of a market.

Texas was again the leading natural-gas producing State in 1930, with Oklahoma second and California third. The output in Texas in 1930 was 11 per cent higher than in 1929, the result chiefly of increased operations in the Panhandle, the starting point for a number of large pipe-line systems.

The number of domestic consumers of natural gas increased materially in 1930, although the gain was much less than that in 1929. The number of domestic consumers in 1930 amounted to 5,448,000, an increase of 350,000 (7 per cent) over 1929. The total consumption of natural gas by domestic (including commercial) consumers in 1930 amounted to 376,407,000,000 cubic feet, an increase of 5 per cent over 1929. The total consumption of natural gas for industrial purposes in 1930 amounted to 1,565,237,000,000 cubic feet, an increase of only 0.5 per cent over 1929. The downward trend in the price paid for natural gas for industrial purposes and the upward trend in the price for domestic consumption were both continued during 1930. The industrial price of natural gas fell from 12.2 cents per thousand cubic feet in 1929 to 11.3 cents in 1930; the domestic price rose from 62 cents per thousand cubic feet in 1929 to 63.5 cents in 1930.

Summary of statistics for natural gas in the United States, 1926–1930

		1926	1927	1928	1929	1930
Produced and delivered to consumers:						
Arkansas	millions of cubic feet	43,566	30,450	20,235	19,928	18,585
California	do	204,915	212,364	246,215	342,214	334,789
Kansas	do	38,095	42,646	45,644	38,469	37,630
Kentucky	do	10,410	10,206	15,383	27,588	28,023
Louisiana	do	157,423	186,961	227,821	261,138	278,341
Ohio	do	47,363	51,381	56,341	57,936	63,394
Oklahoma	do	286,421	326,864	320,861	357,893	348,116
Pennsylvania	do	107,089	105,709	99,466	101,951	88,706
Texas	do	175,392	254,063	301,990	464,928	517,880
West Virginia	do	180,223	162,375	163,018	167,333	144,180
Wyoming	do	46,567	43,582	47,490	44,648	43,219
Other	do	15,555	18,827	23,675	33,667	40,558
		1,313,019	1,445,428	1,568,139	1,917,693	1,943,421
Consumed:						
Domestic	do	289,175	296,036	320,877	359,853	305,241
Commercial	do					71,166
Industrial—						
Carbon black	do	130,321	144,087	175,137	261,107	266,625
Field	do	478,188	549,455	573,698	705,083	723,165
Electric public-utility power plant fuel [1]	do	53,207	62,919	77,326	112,707	120,290
Refinery fuel	do	121,449	123,395	114,950	103,729	98,842
Portland cement plant fuel [2]	do	(3)	23,640	30,660	41,643	41,256
Other industrial	do	240,513	245,712	275,331	333,329	315,059
		1,312,853	1,445,244	1,567,979	1,917,451	1,941,644
Domestic	per cent	22	20	20	19	16
Commercial	do					4
Industrial	do	78	80	80	81	80
Treated for natural gasoline:						
Millions of cubic feet		1,206,300	1,341,248	1,473,434	1,959,294	2,088,778
Per cent of total consumption		92	93	94	102	108
Consumers:						
Domestic	thousands	3,731	3,984	4,344	[4] 5,098	5,095
Commercial	do					353
Industrial [5]	do	(3)	(3)	(3)	(3)	21
Value at wells:						
Total	thousands of dollars	124,693	127,468	139,898	157,596	147,179
Average per M cubic feet	cents	9.5	8.8	8.9	8.2	7.6
Value at points of consumption:						
Total	thousands of dollars	300,055	317,803	363,631	413,153	415,519
Domestic	do	168,870	180,018	198,808	223,172	205,878
Commercial	do					33,295
Industrial	do	131,185	137,785	164,823	189,981	176,346
Average per M cubic feet—						
Domestic and commercial	cents	58.4	60.8	62.0	62.0	63.5
Domestic	do	(3)	(3)	(3)	(3)	67.4
Commercial	do	(3)	(3)	(3)	(3)	46.8
Industrial	do	12.8	12.0	13.2	12.2	11.3
Domestic, commercial, and industrial	do	22.9	22.0	23.2	21.5	21.4

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[1] U. S. Geological Survey.

[2] Bagley, B. W., Cement in 1930: Mineral Resources of the United States, 1930, Pt. II, Bureau of Mines, p. 421, and eariler reports of series.

[3] Figures not available.

[4] Revised figures.

[5] Exclusive of oil and gas field operators.

NATURAL GAS [1]

By G. R. Hopkins and H. Backus

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SUMMARY

Although the natural-gas industry in 1930 fell far short of repeating the expansion of 1929 it established a new high-production record of 1,943,421,000,000 cubic feet. This amount represents an increase over the previous year of 1.3 per cent, which, although considerably below the average annual increase for the past decade, represents a creditable showing in view of the curtailment in the production of crude petroleum. Exports of natural gas to Canada and Mexico in 1930 amounted to 1,798,000,000 cubic feet, a material increase over the previous year as a result chiefly of increased deliveries to Mexico following the completion of the pipe line from the Jennings field in Texas to Monterrey. During the year, 21,000,000 cubic feet of natural gas was piped into Montana from Canada. This step marked the first importation of gas into the United States from western Canada.

Adding imports to production and deducting exports gives 1,941,644,000,000 cubic feet as the total consumption within the United States in 1930. The number of domestic (including commercial) users of natural gas continued to increase and amounted to 5,448,000, a gain of 7 per cent over the previous year. This increase reflects the completion of the major part of the system from the Monroe-Richland field to Atlanta and the addition of numerous laterals to other systems. Although the average consumption per domestic user was less than in 1929, the proportion of the total consumption utilized for domestic purposes rose from 19 to 20 per cent; the percentage used for industrial purposes accordingly fell from 81 to 80 per cent, the same percentage as in 1927 and 1928. The quantity of gas treated for the recovery of natural gasoline in 1930 amounted to 2,088,778,000,000 cubic feet, or 107 per cent of the quantity produced and delivered to consumers. This year marks the second in succession wherein the amount of natural gas treated has exceeded the amount produced. The excess treated represents largely gas produced from oil wells, which are so located as regards the fuel markets that the residue gas is valueless and is allowed to escape into the air or burned in flares. The production of natural gasoline decreased in 1930, the first decline ever recorded. Considering the close relationship between the natural-gas and natural-gasoline industries, it appears unusual that one could increase while the other declined. This condition was brought about in 1930 through a decline in the average yield of natural gasoline, which in turn resulted mainly from the growth in stabilization. The average prices of natural gas at the wells continued to decline and in 1930 amounted to 7.6 cents per thousand cubic feet, as compared with an average of 8.2 cents in 1929. This decline in prices of natural gas at the wells was reflected in a decrease in the average price paid by the largest users—the industrial consumers—from 12.2 cents per thousand cubic feet in 1929 to 11.3 cents in 1930. However, the average price paid by domestic consumers in 1930—63.5 cents per thousand cubic feet—represents an increase of 1.5 cents over the previous year, an indication that there is little relationship between prices at the wells and at the domestic burners and that the cost of piping the gas represents much the largest item in the price.

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[1] Work on manuscript completed October, 1931.

Summary of statistics for natural gas in the United States, 1926–1930

	1926	1927	1928	1929	1930
Natural gas:					
Production .... millions of cubic feet	1,313,019	1,445,428	1,568,139	1,917,693	1,943,421
Exports—					
To Canada .... do	79	71	84	103	107
To Mexico .... do	87	113	76	139	1,691
Imports from Canada .... do	-------	-------	-------	-------	21
Consumption—					
Domestic .... do	289,175	296,036	320,877	359,853	305,241
Commercial .... do					71,166
Industrial—					
Carbon black .... do	130,321	144,087	175,137	261,107	266,625
Field .... do	478,188	549,455	573,698	705,083	723,165
Electric public-utility power plant fuel [1] .... do	53,207	62,919	77,326	112,707	120,290
Refinery fuel .... do	121,449	123,395	114,950	103,729	98,842
Portland cement plant fuel [2] .... do	(3)	23,640	30,660	41,643	41,256
Other industrial .... do	240,513	245,712	275,331	333,329	315,059
	1,312,853	1,445,244	1,567,979	1,917,451	1,941,644
Domestic .... per cent	22	20	20	19	16
Commercial .... do					4
Industrial .... do	78	80	80	81	80
Number of consumers—					
Domestic .... thousands	3,731	3,984	4,344	[4] 5,098	5,095
Commercial .... do					353
Industrial [5] .... do	(6)	(6)	(6)	(6)	21
Value at wells—					
Total .... thousands of dollars	124,693	127,468	139,898	157,596	147,048
Average per M cubic feet .... cents	9.5	8.8	8.9	8.2	7.6
Value at points of consumption—					
Total .... thousands of dollars	300,055	317,803	363,631	413,153	415,519
Domestic .... do	168,870	180,018	198,808	223,172	205,878
Commercial .... do					33,295
Industrial .... do	131,185	137,785	164,823	189,981	176,346

[1] U. S. Geological Survey.

[2] Bagley, B. W., Cement in 1930: Mineral Resources of the United States, 1930, Pt. II, Bureau of Mines, 1932, p. 421, and earlier reports of series.

[3] Included under "Other industrial"; separate figures not available.

[4] Revised figures.

[5] Exclusive of oil and gas field operators.

[6] Figures not available.

Summary of statistics for natural gas in the United States, 1926–1930—Con.

	1926	1927	1928	1929	1930
Natural gas—Continued.					
Value at points of consumption—Continued.					
Average per M cubic feet—					
Domestic and commercial cents	58.4	60.8	62.0	62.0	63.5
Domestic do	(6)	(6)	(6)	(6)	67.4
Commercial do	(6)	(6)	(6)	(6)	46.8
Industrial do	12.8	12.0	13.2	12.2	11.3
Domestic, commercial, and industrial do	22.9	22.0	23.2	21.5	21.4
Treated for natural gasoline—					
Quantity millions of cubic feet	1,206,300	1,341,248	1,473,434	1,959,294	2,088,778
Per cent of total consumption	92	93	94	102	108
Natural gasoline:					
Production thousands of gallons	1,363,090	1,641,144	1,814,034	2,233,688	2,210,494
Value at plants—					
Total thousands of dollars	136,412	118,688	138,944	158,410	128,160
Average per gallon cents	10.0	7.2	7.7	7.1	5.8
Carbon black:					
Production thousands of pounds	180,576	198,429	248,790	366,442	379,942
Value at plants—					
Total thousands of dollars	9,939	10,955	13,782	18,720	14,852
Average per pound cents	5.5	5.5	5.5	5.1	3.9

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[6] Figures not available.

PRODUCTION

The total production of natural gas in the United States during 1930 amounted to 1,943,421,000,000 cubic feet, an increase over 1929 of 25,728,000,000 cubic feet, or 1.3 per cent. This total does not include the quantity of gas blown into the air in flush-oil fields.

Texas, the leading natural gas-producing State in 1929, strengthened its hold on first place in 1930, when its output was 517,880,000,000 cubic feet, an increase of 11 per cent over the previous year. This gain was due principally to increased output from the Panhandle, the starting point for the majority of the large pipe-line systems that originate in the State. Out of a total of 483 gas wells completed in Texas in 1930, the Panhandle district was credited with 172. Furthermore, on the basis of initial output the Panhandle undoubtedly exceeded the rest of the State, as the majority of the wells completed in the other fields were drilled for oil but, failing in that, were brought in as small gassers. Production in Oklahoma, the second State in rank, showed a small decrease in 1930, as the decline in output of the Seminole district exceeded the gain in output in the Oklahoma City field. California also reported a slight decline in the production of natural gas in 1930; this decrease resulted chiefly from the material decline of the oil fields in the Los Angeles Basin and from the small number of new discoveries in the State. Production in Louisiana increased in 1930 as an aftermath to the expansion of pipe-line systems originating in the Monroe and Richland fields. Some of the States reported material declines in output of natural gas in 1930; the most notable were West Virginia and Pennsylvania, which ranked fifth and sixth, respectively. Production in Michigan in 1930 was less than half the total in 1929, evidence of the rapid decline of the Muskegon field and the failure of drilling to uncover other sources of supply.

Because of the curtailment in drilling the number of gas discoveries in 1930 undoubtedly fell below the total in 1929; however, the number of gas wells completed was practically the same for the two years, being 2,866 in 1930 as compared with 2,870 in 1929. The total initial production of the 1930 completions probably constituted a new record, as an increasing proportion of the wells were drilled with the object of establishing a gas reserve to insure operation of the various large pipe-line systems. This fact accounts for the increase in drilling activity in the Texas Panhandle and in the Richland field of Louisiana. The possibilities of Kentucky as an important source of supply were seriously considered, and the number of gas wells completed in that State during 1930 was practically double that in 1929.

A substantial gas reserve was set up in the Hugoton field of southwest Kansas through the completion of approximately 80 wells in 1930. This field will be used principally as a supplementary source of supply for several of the pipe-line systems running north from the Texas Panhandle. The Jackson field of Mississippi came in for considerable development work in 1931, and a number of very large wells were completed. This, the large field closest to Mississippi, Alabama, and Georgia, will undoubtedly be used as a supplementary source of supply for pipe lines running from the Monroe-Richland area.

The development of the natural-gas industry in New York was spurred by the discovery of the Tyrone or Wayne-Dundee field in Schuyler County in February, 1930. By the end of 1930 a total of 16 wells had been completed in the field, of which 14 were producers averaging approximately 5,000,000 cubic feet in initial daily output.

Similarly, the development of the industry in Pennsylvania was enlivened by the discovery of the Farmington or Tioga field in Tioga County in September, 1930. The first wells in this field were exceptionally large for the eastern fields, and plans were laid to pipe the gas to Syracuse, Williamsport, and other cities.

Natural gas produced in the United States and delivered to consumers, 1906–1930, by States, in millions of cubic feet

Year	Arkansas	California	Illinois	Indiana	Kansas	Kentucky	Louisiana	Montana	New York	Ohio	Oklahoma	Pennsylvania	Texas	West Virginia	Wyoming	Others	Total	Value at points of consumption	
																		Total (thousands of dollars)	Average per M cubic feet (cents)
1906	(1)	153	410	7,861	69,323	789	[2] 1,039	-------	2,548	45,436	3,520	138,161	(2)	119,400	(1)	203	388,843	46,874	12.1
1907	(1)	230	1,155	6,624	76,707	1,303	[2] 1,288	-------	3,288	52,041	4,867	135,516	(2)	122,687	(1)	916	406,622	54,222	13.3
1908	(1)	479	4,979	5,256	80,740	1,430	[2] 1,752	-------	3,843	47,442	11,925	130,476	(2)	112,181	(1)	1,638	402,141	54,640	13.6
1909	(1)	2,324	8,473	6,159	75,074	2,097	[2] 4,365	-------	4,696	53,223	28,037	127,697	(2)	166,435	(1)	2,126	480,706	63,207	13.1
1910	(1)	2,764	6,723	5,760	59,380	1,357	[2] 8,110	-------	6,010	48,232	50,430	126,867	(2)	190,706	(1)	2,816	509,155	70,756	13.9
1911	(1)	6,390	6,762	4,365	38,800	1,275	[3] 9,786	-------	5,240	49,450	67,276	108,869	5,503	206,891	(1)	2,386	512,993	74,622	14.5
1912	(1)	9,355	5,603	3,618	28,068	1,951	[3] 14,493	-------	8,626	56,210	73,799	112,150	7,470	239,007	(1)	1,853	562,203	84,564	15.0
1913	(1)	11,035	4,767	2,921	22,884	1,821	[3] 26,653	-------	8,515	50,612	75,018	118,860	12,160	245,454	(1)	1,198	581,898	87,847	15.1
1914	(1)	17,829	3,548	2,580	22,628	1,422	[3] 26,775	-------	8,935	68,270	78,167	110,745	13,434	236,489	(1)	1,045	591,867	94,116	15.9
1915	[4] 992	21,891	2,690	2,261	27,046	1,667	25,540	6	7,977	79,510	87,517	113,692	13,324	244,004	(1)	462	628,579	101,312	16.1
1916	2,388	31,643	3,534	1,715	31,710	2,107	32,081	213	8,036	69,888	123,517	130,484	15,810	299,319	(1)	725	753,170	120,227	16.0
1917	5,610	49,427	4,439	1,712	24,439	2,802	31,287	334	8,372	68,917	137,384	133,397	17,047	308,617	(1)	1,326	795,110	142,089	17.9
1918	5,295	39,719	4,473	1,667	27,825	3,022	36,094	177	8,461	61,261	124,317	123,813	13,440	265,161	4,339	1,937	721,001	153,554	21.3
1919	5,587	55,607	3,825	1,407	16,150	2,057	47,062	858	8,124	63,153	163,649	113,489	24,710	234,095	6,014	129	745,916	160,888	21.6
1920	9,027	66,041	3,013	1,779	21,158	3,345	58,274	818	8,419	58,938	154,467	125,787	37,063	239,719	10,312	50	798,210	196,194	24.6
1921	4,260	75,942	2,646	1,066	15,717	4,820	58,004	336	6,583	47,412	124,058	86,144	44,504	174,921	15,608	31	662,052	174,617	26.4
1922	9,700	84,580	3,383	947	20,289	5,872	70,267	486	6,947	51,481	140,631	101,276	47,945	195,288	23,427	27	762,546	221,535	29.1
1923	24,215	131.434	4,049	880	30,913	11,953	112,031	1,470	6,497	53,812	203,082	112,562	74,535	203,867	35,523	153	1,006,976	240,001	23.8
1924	36,616	189,692	4,072	998	25,580	12,875	160,945	1,071	6,196	47,396	214,452	105,863	107,247	182,285	46,036	197	1,141,521	253,856	22.2
1925	41,878	187,789	4,165	1,168	26,917	10,770	152,620	1,496	6,210	43,235	249,285	101,632	134,872	180,345	45,539	650	1,188,571	265,271	22.3
1926	43,566	204,915	3,808	901	38,095	10,410	157,423	2,283	7,027	47,363	286,421	107,089	175,392	180,223	46,567	1,536	1,313,019	300,168	22.9
1927	30,450	212,364	3,741	1,124	42,646	10,206	186,961	4,253	5,908	51,381	326,864	105,709	254,063	162,375	43,582	3,801	1,445,428	317,930	22.0
1928	20,235	246,215	3,051	1,290	45,644	15,383	227,821	6,277	7,224	56,341	320,861	99,466	301,990	163,018	47,490	5,833	1,568,139	363,726	23.2
1929	19,928	342,214	2,983	1,012	38,469	27,588	261,138	9,659	8,387	57,936	357,893	101,951	464,928	167,333	44,648	11,626	1,917,693	413,276	21.6
1930	18,585	334,789	2,890	1,217	37,630	28,023	278,341	10,060	9,624	63,394	348,116	88,706	517,880	144,180	43,219	16,767	1,943,421	416,090	21.4

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[1] Included under "Others."

[2] Alabama and Texas included with Louisiana.

[3] Includes Alabama.

[4] Includes gas piped from Oklahoma and consumed in Arkansas.

Natural gas produced and consumed in the United States, 1929 and 1930, by States

State	Produced and delivered to consumers, including deliveries in other States						Consumed, including receipts from other States			
	Quantity		Estimated value at the wells		Value at points of consumption		Quantity		Value at points of consumption	
	M cubic feet	Per cent of total	Total	Average per M cubic feet (cents)	Total	Average per M cubic feet (cents)	M cubic feet	Per cent of total	Total	Average per M cubic feet (cents)
1929										
Ark	19,928,000	1.0	$1,303,000	6.5	$3,802,000	19.1	39,758,000	2.1	$7,587,000	19.1
Calif	342,214,000	17.9	29,054.000	8.5	68,972,000	20.2	342,214,000	17.8	68,972,000	20.2
Colo	2,787,000	.2	71,000	2.5	675,000	24.2	14,362.000	.7	4,539,000	31.6
Ill	2,983.000	.2	307,000	10.3	388,000	13.0	3,139,000	.2	408,000	13.0
Ind	1,012.000	.1	393.000	38.8	518.000	51.2	2,365,000	.1	1,335,000	56.4
Kans	38,469,000	2.0	3,001,000	7.8	13,429,000	34.9	75,476,000	3.9	18,807,000	24.9
Ky	27,588,000	1.4	3,506,000	12.7	8,822.000	32.0	19,444,000	1.0	7,041,000	36.2
La	261,138,000	13.6	7,913,000	3.0	26,505,000	10.1	200,777,000	10.5	15,427,000	7.7
Mich	4,526,000	.2	446,000	9.9	900,400	19.9	4,526,000	.2	900,400	19.9
Miss	90,000	(1)	7,000	7.8	32,000	35.6	574,000	(1)	246,000	42.9
Mo	324.000	(1)	32.000	9.9	164,000	50.6	15,078,000	.8	7,735,000	51.3
Mont	9,659,000	.5	409,000	4.2	2,377,000	24.6	9,332,000	.5	2,007,000	21.5
N. Mex	3,054,000	.2	152,000	5.0	536,000	17.6	1,021,000	.1	240,000	23.5
N. Y	[2] 8,387,000	.4	2,790,000	33.2	5,538,000	66.0	18,192,000	.9	12,059,000	66.3
Ohio	57,936,000	3.0	9,640,000	16.6	32,890,000	56.8	126,631,000	6.6	72,381,000	57.2
Okla	357,893,000	18.7	23,728,000	6.6	53,528,000	15.0	329,295,000	17.2	43,605,000	13.2
Pa	101,951,000	5.3	28,189,000	27.6	48,821,000	47.9	122,876,000	6.4	56,900,000	46.3
S. Dak	99,000	(1)	8,000	8.1	40,000	40.4	1,717,000	.1	696,000	40.5
Tenn	25,000	(1)	2,000	8.0	10,700	42.8	5,395,000	.3	2,181,700	40.4
Texas	[3] 464,928,000	24.3	15,575,000	3.3	67,474,000	14.5	465,526,000	24.3	65,577,000	14.1
Utah	693,000	(1)	14,000	2.0	205,000	29.6	1,539,000	.1	456,000	29.6
W. Va	167,333,000	8.7	29,384,000	17.6	73,793,000	44.1	73,856,000	3.9	20,022,000	27.1
Wyo	44,648,000	2.3	1,670,000	3.7	3,850,000	8.6	43,500,000	2.3	3,437,000	7.9
Other [4]	28,000	(1)	2,000	7.1	5,900	21.1	858,000	(1)	593,900	69.2
	1,917,693,000	100.0	157,596,000	8.2	413,276,000	21.6	1,917,451,000	100.0	413,153,000	21.5
1930										
Ala	------------	-----	------------	------	------------	------	1,155,000	.1	633,000	54.8
Ark	18,585,000	1.0	1,022,000	5.5	3,540,000	19.0	38,231,000	2.0	7,282,000	19.0
Calif	334,789,000	17.2	25,210,000	7.5	69,071,000	20.6	334,789,000	17.2	69,071,000	20.6
Colo	3,312,000	.2	80,000	2.4	958,000	28.9	16,642,000	.9	5,445,000	32.7
Ga	------------	-----	------------	------	------------	------	1,497,000	.1	1,742,000	116.4
Ill	2,890,000	.2	239,000	8.3	505,000	17.5	9,602,000	.5	1,676,000	17.5
Ind	1,217,000	.1	359,000	29.5	676,000	55.5	2,515,000	.1	1,466,000	58.3
Kans	37,630,000	1.9	2,980,000	7.9	12,459,000	33.1	75,635,000	3.9	19,509,000	25.8
Ky	28,023,000	1.4	4,260,000	15.2	9,691,000	34.6	15,966,000	.8	6,591,000	41.3
La	278,341,000	14.3	8,378,000	3.0	35,895,000	12.9	184,096,000	9.5	16,230,000	8.8
Mich	2,075,000	.1	232,000	11.2	625,000	30.1	2,075,000	.1	625,000	30.1
Miss	179,000	(1)	10,000	5.6	86,000	48.0	1,735,000	.1	830,000	47.8
Mo	1,064,000	.1	72,000	6.8	326,000	30.6	26,122,000	1.3	10,326,000	39.5
Mont	10,060,000	.5	407,000	4.0	2,990,000	29.7	[5] 8,065,000	.4	2,234,000	27.7
Nebr	------------	-----	------------	------	------------	------	1,098,000	.1	350,000	31.9
N. Mex	9,497,000	.5	313,000	3.3	1,273,000	13.4	3,935,000	.2	498,000	12.7
N. Y	[6] 9,624,000	.5	3,087,000	32.1	6,433,000	66.8	18,991,000	1.0	12,676,000	66.7
Ohio	63,394,000	3.3	10,859,000	17.1	36,491,000	57.6	125,816,000	6.5	72,545,000	57.7
Okla	348,116,000	17.9	17,649,000	5.1	47,632,000	13.7	320,851,000	16.5	35,735,000	11.1
Pa	88,706,000	4.6	25,760,000	29.0	44,521,000	50.2	108,218,000	5.6	51,760,000	47.8
S. Dak	98,000	(1)	8,000	8.2	32,000	32.7	2,905,000	.1	965,000	33.2
Tenn	24,000	(1)	3,000	12.5	9,000	37.5	7,334,000	.4	2,666,000	36.4
Tex	[7] 517,880,000	26.6	18,488,000	3.6	71,873,000	13.9	526,160,000	27.1	70,687,000	13.4
Utah	393,000	(1)	8,000	2.0	123,000	31.3	4,045,000	.2	1,260,000	31.1
W. Va	144,180,000	7.4	26,010,000	18.0	66,553,000	46.2	62,882,000	3.2	18,728,000	29.8
Wyo	43,219,000	2.2	1,604,000	3.7	4,277,000	9.9	40,219,000	2.1	3,280,000	8.2
Other [4]	125,000	(1)	10,000	8.0	51,000	40.8	1,065,000	(1)	709,000	66.6
	1,943,421,000	100.0	147,048,000	7.6	416,090,000	21.4	1,941,644,000	100.0	415,519,000	21.4

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[1] Less than 0.1 per cent.

[2] Includes 103,000 M cubic feet consumed in Canada.

[3] Includes 139,000 M cubic feet consumed in Mexico.

[4] Alaska, Iowa, Maryland (consumption only), North Dakota, and Washington.

[5] Includes 21,000 M cubic feet piped from Canada.

[6] Includes 107,000 M cubic feet piped to Canada.

[7] Includes 1,691,000 M cubic feet piped to Mexico.

CONSUMPTION

Total consumption.—The total consumption of natural gas, computed by deducting exports to Canada and Mexico from the total of production plus imports, amounted in 1930 to 1,941,644,000,000 cubic feet, an increase over 1929 of 1.3 per cent. (See fig. 7.) The practice of storing gas in depleted sands in periods of low consumption progressed during the year, but the amount stored in 1930 was not regarded as large enough to affect the total consumption. Of the total consumption, 1,565,237,000,000 cubic feet, or 80 per cent, was consumed for industrial purposes, and 376,407,000,000 cubic feet, or 20 per cent, was utilized by domestic and commercial consumers. These data indicate a slight growth in relative importance of domestic consumption as compared with 1929.

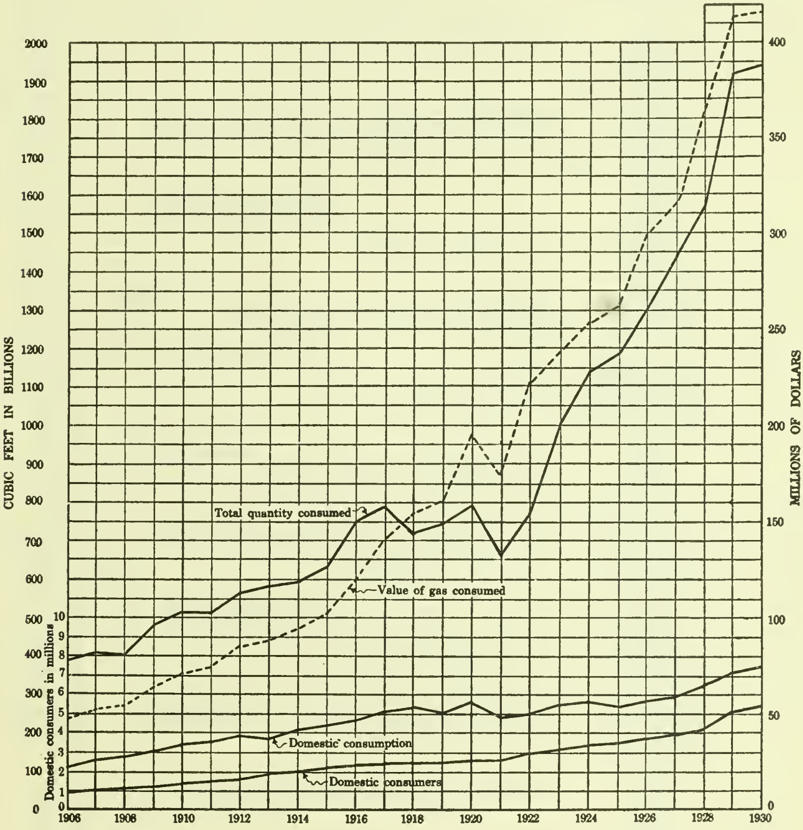

FIGURE 7.—Growth of natural-gas consumption in the United States, 1906–1930

Natural gas consumed in the United States, 1906–1930

Year	Domestic consumption (including commercial)[1]					Industrial consumption									Total consumption	
	Number of consumers (thousands)	Billions of cubic feet	Average number of M cubic feet used per consumer	Per cent of total consumption	Average value at points of consumption per M cubic feet (cents)	Field (billions of cubic feet)	Carbon black (billions of cubic feet)	Refineries (billions of cubic feet)	Electric public-utility power plants[2] (billions of cubic feet)	Portland cement plants[3] (billions of cubic feet)	Other industrial (billions of cubic feet)	Total industrial (billions of cubic feet)	Per cent of total consumption	Average value at points of consumption per M cubic feet (cents)	Billions of cubic feet	Average value at points of consumption per M cubic feet (cents)
1906	875	110	126.2	28	22.7	(4)	(4)	(4)	(4)	(4)	(4)	279	72	7.8	389	12.1
1907	1,058	132	124.2	32	23.7	(4)	(4)	(4)	(4)	(4)	(4)	275	68	8.4	407	13.3
1908	1,166	141	120.6	35	23.6	(4)	(4)	(4)	(4)	(4)	(4)	261	65	8.2	402	13.6
1909	1,223	151	123.6	31	24.2	(4)	(4)	(4)	(4)	(4)	(4)	330	69	8.1	481	13.1
1910	1,328	170	127.9	33	24.4	(4)	(4)	(4)	(4)	(4)	(4)	339	67	8.6	509	13.9
1911	1,498	175	117.1	34	25.3	(4)	(4)	(4)	(4)	(4)	(4)	338	66	9.0	513	14.5
1912	1,623	193	119.2	34	26.3	(4)	(4)	(4)	(4)	(4)	(4)	369	66	9.1	562	15.0
1913	1,911	185	96.8	32	27.3	(4)	(4)	(4)	(4)	(4)	(4)	397	68	9.4	582	15.1
1914	2,078	203	97.8	34	28.0	(4)	(4)	(4)	(4)	(4)	(4)	389	66	9.6	592	15.9
1915	2,195	217	98.9	35	28.3	(4)	(4)	(4)	(4)	(4)	(4)	412	65	9.7	629	16.1
1916	2,362	235	99.6	31	28.6	(4)	(4)	(4)	(4)	(4)	(4)	518	69	10.2	753	16.0
1917	2,431	258	106.2	32	30.8	(4)	(4)	(4)	(4)	(4)	(4)	537	68	11.7	795	17.9
1918	2,509	271	108.1	38	31.4	(4)	(4)	(4)	(4)	(4)	(4)	450	62	15.2	721	21.3
1919	2,501	256	102.2	34	34.6	170	50	(5)	21	(5)	[5] 249	490	66	14.8	746	21.6
1920	2,615	286	109.4	36	38.2	202	41	(5)	25	(5)	[5] 244	512	64	17.0	798	24.6
1921	2,631	248	94.4	38	44.4	182	51	(5)	24	(5)	[5] 157	414	62	15.5	662	26.4
1922	3,015	255	84.4	33	49.9	198	54	(5)	27	(5)	[5] 229	508	67	18.6	763	29.1
1923	3,234	277	85.7	28	51.4	343	109	(5)	31	(5)	[5] 247	730	72	13.4	1,007	23.8
1924	3,443	285	82.8	25	54.0	393	157	(5)	48	(5)	[5] 258	856	75	11.6	1,141	22.2
1925	3,508	272	77.6	23	56.0	424	140	88	46	(5)	[5] 218	916	77	12.3	1,188	22.3
1926	3,731	289	77.5	22	58.4	478	131	122	53	(5)	[5] 240	1,024	78	12.8	1,313	22.9
1927	3,984	296	74.3	20	60.8	549	144	123	63	24	246	1,149	80	12.0	1,445	22.0
1928	4,344	321	73.9	20	62.0	574	175	115	77	31	275	1,247	80	13.2	1,568	23.2
1929	[6] 5,098	360	[6] 70.6	19	62.0	705	261	104	113	41	333	1,557	81	12.2	1,917	21.5
1930	5,448	377	69.1	20	63.5	723	267	99	120	41	315	1,565	80	11.3	1,942	21.4

[1] For separation in 1930 see table, p. 466.
[2] From U. S. Geological Survey.
[3] Bagley, B. W., Cement: Mineral Resources of the United States, 1930, Pt. II, Bureau of Mines, 1932, p. 421.
[4] Figures not available.
[5] Refinery fuel included under "Other industrial," 1919–1924; Portland cement plant fuel included under "Other industrial," 1919–1926; separate figures not available.
[6] Revised figures.

Domestic consumption.—The number of domestic consumers of natural gas increased materially in 1930, although the gain was much less than that in 1929. The number of domestic consumers in 1930 amounted to 5,448,180, an increase of 350,320, or 7 per cent, over 1929. Beginning with 1930, domestic consumers were divided into two classes, namely, the strictly domestic or home users and commercial consumers, such as stores and shops. The number of strictly domestic users amounted to 5,095,500; the number of commercial consumers totaled 352,680, a ratio of about 14 to 1. The gain in number of domestic consumers in 1930 resulted chiefly from the completion of most of the system between the Monroe-Richland field and Atlanta, the construction of laterals to the system between the Kettleman Hills field and the San Francisco Bay district, and the construction of numerous small lines in practically every State using natural gas. Three States—Alabama, Georgia, and Nebraska—were added to the consuming States in 1930, which brings the total, exclusive of Alaska, to 30.

The total consumption of natural gas for domestic and commercial purposes in 1930 amounted to 376,407,000,000 cubic feet, an increase of 5 per cent over the previous year. The average consumption per domestic consumer continued to fall and in 1930 amounted to 69,100 cubic feet as compared with 70,600 cubic feet in 1929. On the basis of the prevailing prices, each domestic customer paid an average of $43.88 for natural gas in 1930, as compared with an average of $43.77 in 1929. The increased cost, in the face of a drop in the total used, resulted from an increase in the average price.

The gas burned by domestic and commercial consumers in 1930 had a total value of $239,173,000, or an average of 63.5 cents per thousand cubic feet. This average price, the highest recorded so far, represents an increase of 1.5 cents over that for 1929. The strictly domestic users paid an average of 67.4 cents per thousand cubic feet in 1930, as compared with an average of 46.8 cents for the commercial consumers. The highest price recorded for the strictly domestic users in 1930 was $1.417 per thousand cubic feet, paid by consumers in Georgia; the lowest was $0.377 per thousand, paid by the West Virginia consumers.

Domestic and commercial consumption of natural gas in the United States, 1929 and 1930, by States

State	1929				1930											
	Domestic (including commercial)[1]				Domestic				Commercial				Total			
	Number of consumers	M cubic feet	Value at points of consumption		Number of consumers	M cubic feet	Value at points of consumption		Number of consumers	M cubic feet	Value at points of consumption		Number of consumers	M cubic feet	Value at points of consumption	
			Total	Average (cents)			Total	Average (cents)			Total	Average (cents)			Total	Average (cents)
Alabama	----------	----------	----------	------	20,040	407,000	$455,000	111.8	200	16,000	$11,000	68.8	20,240	423,000	$466,000	110.2
Arkansas	61,620	7,535,000	$3,661,000	48.6	55,500	6,028,000	3,117,000	51.7	10,330	2,310,000	912,000	39.5	65,830	8,338,000	4,029,000	48.3
California	1,239,150	43,499,000	37,785,000	86.9	1,273,310	40,674,000	36,385,000	89.5	57,080	6,845,000	4,932,000	72.1	1,330,390	47,519,000	41.317,000	86.9
Colorado	77,150	2,731,000	2,524,000	92.4	80,080	3,775,000	3,221,000	85.3	6,560	1,366,000	684,000	50.1	86,640	5,141,000	3,905,000	76.0
Georgia	----------	----------	----------	------	56,860	1,117,000	1,583,000	141.7	210	51,000	31,000	60.8	57,070	1,168,000	1,614,000	138.2
Illinois	13,160	94,000	79,000	84.0	12,970	92,000	97,000	105.4	180	23,000	21,000	91.3	13,150	115,000	118,000	102.6
Indiana	16,230	696,000	451,000	64.8	19,460	717,000	605,000	84.4	500	261,000	118,000	45.2	19,960	978,000	723,000	73.9
Kansas	169,740	15,539,000	9,391,000	60.4	171,340	13,339,000	8,821,000	66.1	14,850	3,981,000	1,462,000	36.7	186,190	17,320,000	10,283,000	59.4
Kentucky	156,850	11,501,000	5,238,000	45.5	143,710	8,942,000	4,338,000	48.5	16,710	1,732,000	793,000	45.8	160,420	10,674,000	5,131,000	48.1
Louisiana	115,050	7,917,000	4,275,000	54.0	115,900	6,321,000	4,069,000	64.4	12,000	2,253,000	992,000	44.0	127,900	8,574,000	5,061,000	59.0
Michigan	11,190	342,000	356,000	104.1	11,190	290,000	348,000	120.0	130	65,000	34,000	52.3	11,320	355,000	382,000	107.6
Mississippi	4,250	518,000	234,000	45.2	14,320	458,000	519,600	113.4	1,590	226,000	114,000	50.4	15,910	684,000	633,600	92.6
Missouri	121,150	7,224,000	6,176,000	85.5	103,920	5,989,000	5,836,600	97.5	19,200	3,169,000	1,369,000	43.2	123,120	9,158,000	7,205,600	78.7
Montana	15,250	3,033,000	1,290,000	42.5	16,580	2,456,000	1,172,000	47.7	2,300	1,179,000	386,000	32.7	18,880	3,635,000	1,558,000	42.9
Nebraska	----------	----------	----------	------	22,230	141,000	143,000	101.4	1,730	39,000	29,000	74.4	23,960	180,000	172,000	95.6
New Mexico	1,970	181,000	118,000	65.2	5,130	271,000	198,000	73.1	540	157,000	66,000	42.0	5,670	428,000	264,000	61.7
New York	248,100	16,531,000	11,130,000	67.3	243,440	14,795,000	10,105,000	68.3	29,700	2,120,000	1,443,000	68.1	273,140	16,915,000	11,548,000	68.3
Ohio	1,214,170	88,169,000	56,271,000	63.8	1,182,330	81,857,000	52,561,000	64.2	56,970	9,022,000	5,323,000	59.0	1,239,300	90,879,000	57,884,000	63.7
Oklahoma	225,050	31,263,000	13,929,000	44.6	212,210	20,114,000	10,849,000	53.9	23,300	8,092,000	2,910,000	36.0	235,510	28,206,000	13,759,000	48.8
Pennsylvania	634,180	53,223,000	32,707,000	61.5	597,190	44,682,000	27,665,000	61.9	40,030	7,292,000	4,224,000	57.9	637,220	51,974,000	31,889,000	61.4
South Dakota	3,710	870,000	546,000	62.8	3,920	575,000	437,000	76.0	690	597,000	219,000	36.7	4,610	1,172,000	656,000	56.0
Tennessee	35,840	1,311,000	1,280,000	97.6	35,220	1,413,000	1,299,000	91.9	3,590	833,000	423,000	50.8	38,810	2,246,000	1,722,000	76.7
Texas	503,070	38,830,000	24,878,000	64.1	485,200	28,330,000	22,707,000	80.2	36,350	12,728,000	4,438,000	34.9	521,550	41,058,000	27,145,000	66.1
Utah	[2] 17,900	397,000	356,000	89.7	19,410	963,000	798,000	82.9	50	104,000	29,000	27.9	19,460	1,067,000	827,000	77.5
West Virginia	184,620	24,921,000	8,624,000	34.6	158,190	18,725,000	7,067,000	37.7	14,710	5,099,000	1,732,000	34.0	172,900	23,824,000	8,799,000	36.9
Wyoming	14,820	2,877,000	1,340,000	46.6	12,730	2,086,000	931,000	44.6	1,850	1,431,000	498,000	34.8	14,580	3,517,000	1,429,000	40.6
Other [3]	13,640	651,000	533,000	81.9	23,120	684,000	550,800	80.5	1,330	175,000	102,000	58.3	24,450	859,000	652,800	76.0
	[2]5,097,860	359,853,000	223,172,000	62.0	5,095,500	305,241,000	205,878,000	67.4	352,680	71,166,000	33,295,000	46.8	5,448,180	376,407,000	239,173,000	63.5

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[1] Domestic and commercial not separately reported prior to 1930.
[2] Revised figures.
[3] Alaska, Iowa, Maryland, North Dakota, and Washington.

Industrial consumption.—The total consumption of natural gas for industrial purposes in 1930 amounted to 1,565,237,000,000 cubic feet, an increase of 0.5 per cent over 1929. Of the total, 723,165,000,000 cubic feet, or 46 per cent, was used for field purposes; 266,625,000,000 cubic feet, or 17 per cent, was used in the manufacture of carbon black; 120,290,000,000 cubic feet, or 8 per cent, was burned as fuel by electric public-utility power plants; 98,842,000,000 cubic feet, or 6 per cent, was utilized as fuel at petroleum refineries; 41,256,000,000 cubic feet, or 3 per cent, was burned at Portland cement plants; and 315,059,000,000 cubic feet, or 20 per cent, was used for miscellaneous industrial purposes. (See fig. 8.) These data indicate gains in the

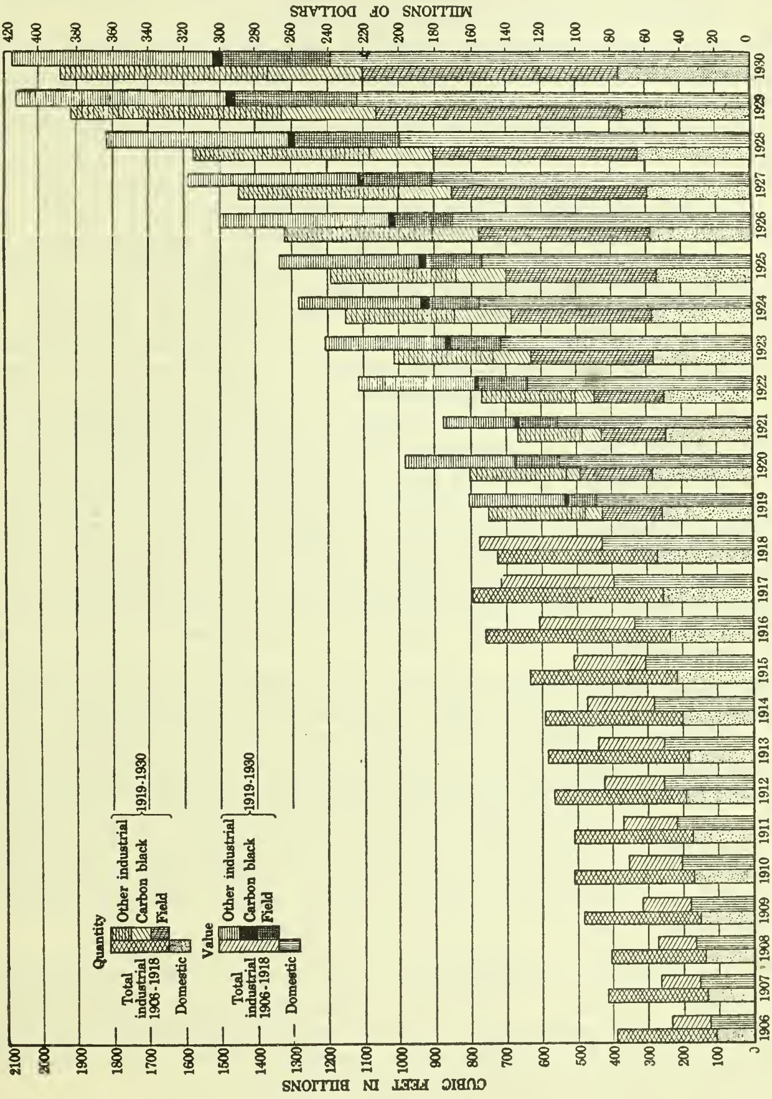

FIGURE 8.—Quantity and value of natural gas consumed in the United States, 1906-1930

relative importance of field and public-utility plants at the expense of refineries and miscellaneous industrial purposes. In 1930, for the first time in a number of years, an attempt was made to obtain data as to the number of industrial consumers of natural gas in the United States. This survey indicated that the total number of industrial consumers in 1930 amounted to approximately 21,000, which undoubtedly represents an increase over the previous year.

The use of natural gas as fuel in the field was again the most important class of industrial consumption. The quantity so consumed increased from 705,083,000,000 cubic feet in 1929 to 723,165,000,000 cubic feet in 1930, which was somewhat suprising in view of the declines in drilling and in the production of natural gasoline. Oklahoma, California, and Texas, the three leading crude-producing States, were the principal consumers of natural gas for field purposes in 1930.

The use of natural gas in the manufacture of carbon black, the second most important class of industrial consumption, increased from 261,107,000,000 cubic feet in 1929 to 266,625,000,000 cubic feet in 1930. This gain, while important, was much less than that recorded in 1929. The relative importance of Texas as a carbon black-producing State was considerably enhanced in 1930, when the quantity of natural gas burned increased 17 per cent over that in 1929, while the amount burned in Louisiana, the State ranking second, declined 18 per cent. These two States together handled 98 per cent of the natural gas burned for carbon black in 1930. The increased demand for Louisiana gas for domestic purposes has resulted in a stiffening of the price in that State, which is the chief cause of the continued migration of the industry to the Texas Panhandle. The gas burned for carbon black in 1930 had an average value of 2.3 cents per thousand cubic feet, which, although low as compared with prices paid by domestic consumers, represents an increase of 0.3 cent per thousand over 1929.

The total consumption of natural gas as fuel under stills and boilers at petroleum refineries in 1930 amounted to 98,842,000,000 cubic feet, a decline of 4,887,000,000 cubic feet, or 5 per cent, from 1929. The decline in the use of natural gas as refinery fuel was fairly general and resulted chiefly from a decrease in the quantity of crude oil processed. In view of the competition afforded by fuel oil and refinery gas, it is somewhat surprising that the use of natural gas at petroleum refineries did not show a greater decline in 1930. The consumption of natural gas at petroleum refineries seems almost certain to decrease in importance as that of refinery gas increases.

The consumption of natural gas by electric public-utility power plants amounted to 120,290,000,000 cubic feet in 1930, an increase of 7 per cent over 1929. This figure constitutes a new record for this use, although the percentage increase was much below that of 1929. Natural gas is used by public-utility plants in 18 States; the two most important consumers are Texas and California.

The consumption of natural gas by Portland cement plants in 1930 remained practically unchanged from that in 1929; the total in 1930 was 41,256,000,000 cubic feet, as compared with 41,643,000,000 cubic feet in 1929. During 1930 natural gas was used as fuel at 28 Portland cement plants located in the 10 following States: Alabama, Arkansas, California, Colorado, Kansas, Missouri, Nebraska, Oklahoma, South Dakota, and Texas.

The heading "Other industrial" consumption covers consumption of natural gas by steel plants, glass works, ice plants, brick and terra cotta establishments, and many other industries where absolute control of temperature is necessary. During 1930 a total of 315,059,000,000 cubic feet was consumed by the miscellaneous industries, a decline of 5 per cent from 1929. Although many of the miscellaneous industries find natural gas practically indispensable, or are located where no other fuel is available, a number of them have their choice of using coal, oil, or natural gas. Although the average price paid by industrial users of natural gas decreased in 1930, the decrease was probably less than the decline in prices of fuel oil and coal. This smaller decrease in price and the general slowing down in industrial activity are possible explanations for the decline in consumption of natural gas by the miscellaneous industries in 1930.

The substantial shut-in production of natural gas and the large amounts wasted incident to the production of oil and natural gasoline have focused attention on the possibilities of finding uses for natural gas other than as a fuel. Of these the use in the manufacture of carbon black is probably the best known; but, unfortunately, this field is overdeveloped at present. There remains the possibility of utilizing natural gas for the production of chemicals. In this connection the bureau has prepared a report,[2] which concludes as follows:

> Even if the technical difficulties attendant upon the commercial production of the various products mentioned are solved, the economic side of the problem should receive serious consideration. Since, however, the raw material under consideration is virtually a waste product, any return, however small, would be profitable and an aid to conservation of our natural resources. Moreover, it has happened many times in the development of the chemical industries that the large production of a chemical product at an attractive price has stimulated its use. For example, benzene, which at present is too high in price for widespread use as an antiknock medium in motor fuel, would undoubtedly be attractive to many refineries if available at a more moderate cost. Finally, most of these processes, while they may appear simple on paper, probably will not be ready for general use for several years, as there are many technical difficulties to be solved before commercial application is feasible. When the processes are ready for commercial use many of the present economic hindrances may have disappeared. But, regardless of economic considerations, the study of these reactions involving the use of natural gas is of importance both at present and for the future, for, as mentioned previously, that which is a chemical curiosity to-day becomes the commonplace and important chemical to-morrow. (See fig. 9.)

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[2] Smith, H. M., Possible Utilization of Natural Gas for the Production of Chemical Products: Inf. Circ. 6388, Bureau of Mines, 1930, 5 pp.

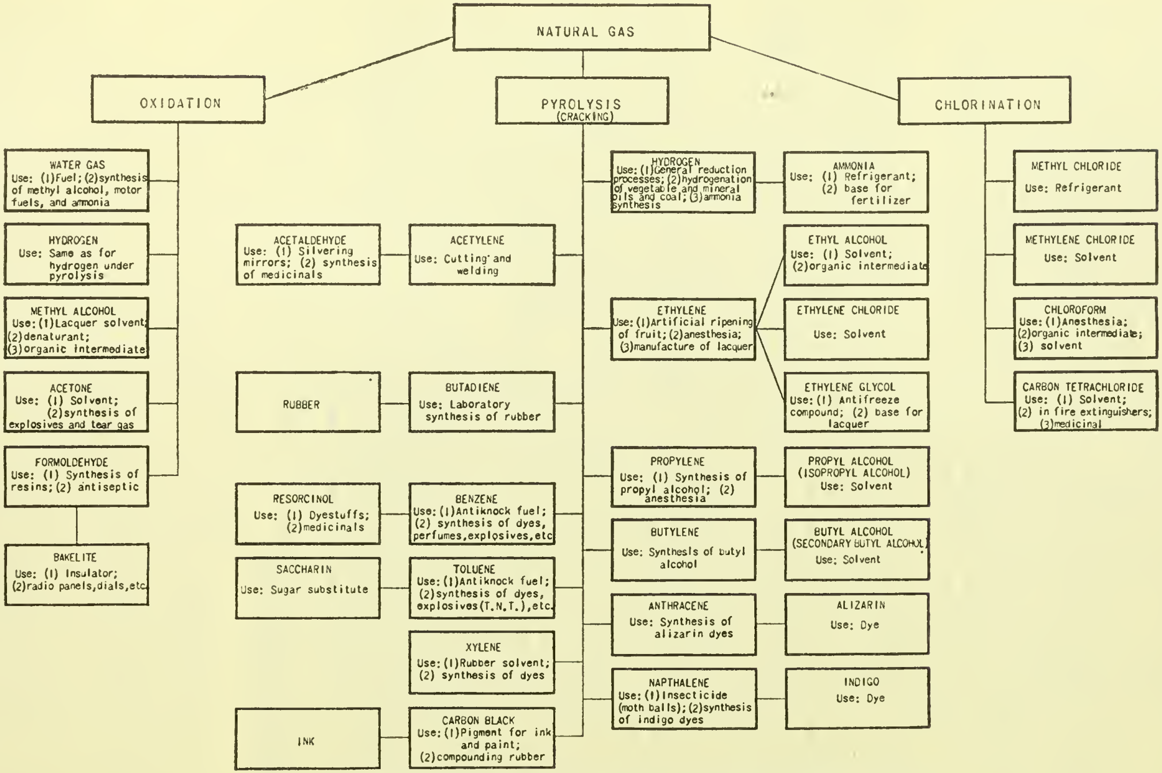
NATURAL GAS
OXIDATION
PYROLYSIS (CRACKING)
CHLORINATION
WATER GAS Use: (1)Fuel; (2)synthesis of methyl alcohol, motor fuels, and ammonia
HYDROGEN Use: Same as for hydrogen under pyrolysis
METHYL ALCOHOL Use: (1)Lacquer solvent; (2)denaturant; (3)organic intermediate
ACETONE Use: (1) Solvent; (2)synthesis of explosives and tear gas
FORMOLDEHYDE Use: (1) Synthesis of resins; (2) antiseptic
BAKELITE Use: (1) Insulator; (2)radio panels,dials,etc
ACETALDEHYDE Use: (1) Silvering mirrors; (2) synthesis of medicinals
ACETYLENE Use: Cutting and welding
RUBBER
BUTADIENE Use: Laboratory synthesis of rubber
RESORCINOL Use: (1) Dyestuffs; (2)medicinals
BENZENE Use: (1)Antiknock fuel; (2) synthesis of dyes, perfumes,explosives,etc
SACCHARIN Use: Sugar substitute
TOLUENE Use: (1)Antiknock fuel; (2)synthesis of dyes, explosives(T.N.T.),etc
XYLENE Use: (1)Rubber solvent; (2) synthesis of dyes
INK
CARBON BLACK Use: (1)Pigment for ink and paint; (2)compounding rubber
HYDROGEN Use: (1)General reduction processes; (2)hydrogenation of vegetable and mineral oils and coal; (3)ammonia synthesis
AMMONIA Use: (1) Refrigerant; (2) base for fertilizer
ETHYLENE Use: (1)Artificial ripening of fruit; (2)anesthesia; (3)manufacture of lacquer
ETHYL ALCOHOL Use: (1) Solvent; (2)organic intermediate
ETHYLENE CHLORIDE Use: Solvent
ETHYLENE GLYCOL Use: (1) Antifreeze compound; (2) base for lacquer
PROPYLENE Use: (1) Synthesis of propyl alcohol; (2) anesthesia
PROPYL ALCOHOL (ISOPROPYL ALCOHOL) Use: Solvent
BUTYLENE Use: Synthesis of butyl alcohol
BUTYL ALCOHOL (SECONDARY BUTYL ALCOHOL) Use: Solvent
ANTHRACENE Use: Synthesis of alizarin dyes
ALIZARIN Use: Dye
NAPTHALENE Use: (1) Insecticide (moth balls); (2)synthesis of indigo dyes
INDIGO Use: Dye
METHYL CHLORIDE Use: Refrigerant
METHYLENE CHLORIDE Use: Solvent
CHLOROFORM Use: (1)Anesthesia; (2)organic intermediate; (3) solvent
CARBON TETRACHLORIDE Use: (1) Solvent; (2) in fire extinguishers; (3)medicinal

FIGURE 9.—Possible utilization of natural gas for the manufacture of chemical products

Industrial consumption of natural gas in the United States, 1929 and 1930, by States and uses

State	Field (drilling, pumping, and operating gasoline recovery plants)		Manufacture of carbon black			Fuel at petroleum refineries, electric public-utility power plants, Portland cement plants, and other industrial						Total industrial		
	M cubic feet (estimated)	Value at points of consumption (estimated)	M cubic feet	Value at points of consumption		M cubic feet				Value at points of consumption		M cubic feet	Value at points of consumption	
				Total	Average (cents)	Petroleum refineries	Electric public-utility power plants	Portland cement plants	Other industrial	Total	Average (cents)		Total	Average (cents)
1929														
Arkansas	15,221,000	$1,274,000	----	----	----	4,548,000	1,222,000	(1)	[2] 11,232,000	$2,652,000	15.6	32,223,000	$3,926,000	12.2
California	216,337,000	18,409,000	----	----	----	17,205,000	26,914,000	(1)	[2] 38,259,000	12,778,000	15.5	298,715,000	31,187,000	10.4
Colorado	830,000	27,000	----	----	----	5,000	----	(1)	[2] 10,796,000	1,988,000	18.4	11,631,000	2,015,000	17.3
Illinois	2,895,000	297,000	----	----	----	----	----	----	150,000	32,000	21.3	3,045,000	329,000	10.8
Indiana	23,000	3,000	----	----	----	----	----	----	1,646,000	881,000	53.5	1,669,000	884,000	53.0
Kansas	11,990,000	1,470.000	----	----	----	[3] 5,595,000	11,288,000	9,868,000	[3] 21,196,000	7,946,000	16.6	59,937,000	9,416,000	15.7
Kentucky	1,291,000	162,000	----	----	----	----	----	----	6,652,000	1,641,000	24.7	7,943,000	1,803,000	22.7
Louisiana	25,030,000	1,006,000	103,846,000	$2,355,000	2.3	16,971,000	17,284,000	----	29,729,000	7,791,000	12.2	192,860,000	11,152,000	5.8
Michigan	520,000	51,000	----	----	----	----	----	----	3,664,000	493,400	13.5	4,184,000	544,400	13.0
Mississippi	4,000	1,000	----	----	----	----	33,000	----	19,000	11,000	21.2	56,000	12,000	21.4
Missouri	12,000	2,000	----	----	----	[3] 636,000	456,000	(1)	[2][3] 6,750,000	1,557,000	19.9	7,854,000	1,559,000	19.8
Montana	1,008,000	115,000	2,142,000	43,000	2.0	248,000	571,000	----	2,330,000	559,000	17.8	6,299,000	717,000	11.4
New Mexico	555,000	33,000	----	----	----	----	25,000	----	260,000	89,000	31.2	840,000	122,000	14.5
New York	269,000	96.000	----	----	----	250,000	23,000	----	1,119,000	833,000	59.8	1,661,000	929,000	55.9
Ohio	5,117,000	1,448,000	----	----	----	13,000	4,070,000	----	29,262,000	14,662,000	44.0	38,462,000	16,110,000	41.9
Oklahoma	247,539,000	23,150,000	(1)	(1)	(1)	15,189,000	8,606,000	(1)	[2][4] 26,698,000	[4] 6,526,000	12.9	298,032,000	29,676,000	10.0
Pennsylvania	6,929,000	2,118,000	----	----	----	939,000	69,000	----	61,716,000	22,075,000	35.2	69,653,000	24,193,000	34.7
South Dakota	----	----	----	----	----	----	----	(1)	[2] 847,000	150,000	17.7	847,000	150,000	17.7
Tennessee	(1)	(1)	----	----	----	----	3,392,000	----	[5] 692,000	[5] 901,700	22.1	4,084,000	901,700	22.1
Texas	128,454,000	14,067,000	150,975,000	2,583,000	1.7	26,115,000	38,365,000	12,816,000	69,971,000	24,049,000	16.3	426,696,000	40,699,000	9.5
Utah	----	----	(1)	(1)	(1)	----	----	----	[4] 1,142,000	[4] 100,000	8.8	1,142,000	100,000	8.8
West Virginia	18,844,000	3,722,000	342,000	48,000	14.0	1,684,000	153,000	----	27,912,000	7,628,000	25.6	48,935,000	11,398,000	23.3
Wyoming	22,207,000	900,000	(1)	(1)	(1)	14,331,000	236,000	----	[4] 3,849,000	[4] 1,197,000	6.5	40,623,000	2,097,000	5.2
Other States [6]	8,000	1,000	3,802,000	79,000	2.1	----	----	18,959,000	205,000	60,900	29.7	207,000	60,900	29.4
	705,083,000	68,352,000	261,107,000	5,108,000	2.0	103,729,000	112,707,000	41,643,000	333,329,000	116,521,000	19.7	1,557,598,000	189,981,000	12.2

[1] Included under "Other States" for United States total and under "Other industrial" for State total to avoid disclosing figures of individual operators.

[2] Includes gas used at cement plants.

[3] Revised figures.

[4] Includes gas consumed in manufacture of carbon black.

[5] Includes gas consumed in field operations.

[6] Alaska, Maryland, and North Dakota.

Industrial consumption of natural gas in the United States, 1929 and 1930, by States and uses—Continued

State	Field (drilling, pumping, and operating gasoline recovery plants)		Manufacture of carbon black			Fuel at petroleum refineries, electric public-utility power plants, Portland cement plants, and other industrial						Total industrial		
	M cubic feet (estimated)	Value at points of consumption (estimated)	M cubic feet	Value at points of consumption		M cubic feet				Value at points of consumption		M cubic feet	Value at points of consumption	
				Total	Average (cents)	Petroleum refineries	Electric public-utility power plants	Portland cement plants	Other industrial	Total	Average (cents)		Total	Average (cents)
1930														
Alabama								(1)	[2] 732,000	$167,000	22.8	732,000	$167,000	22.8
Arkansas	13,455,000	$1,207,000				3,639,000	1,544,000	(1)	[2] 11,255,000	2,046,000	12.4	29,893,000	3,253,000	10.9
California	210,794,000	16,128,000				23,322,000	26,173,000	(1)	[2] 26,981,000	11,626,000	15.2	287,270,000	27,754,000	9.7
Colorado	976,000	33,000				5,000		(1)	[2] 10,520,000	1,507,000	14.3	11,501,000	1,540,000	13.4
Georgia									329,000	128,000	38.9	329,000	128,000	38.9
Illinois	2,806,000	235,000				149,000			6,532,000	1,323,000	19.8	9,487,000	1,558,000	16.4
Indiana	28,000	3,000					1,000		1,508,000	740,000	49.0	1,537,000	743,000	48.3
Kansas	10,490,000	1,182,000				4,526,000	12,636,000	9,649,000	21,014,000	8,044,000	16.8	58,315,000	9,226,000	15.8
Kentucky	1,032,000	199,000							4,260,000	1,261,000	29.6	5,292,000	1,460,000	27.6
Louisiana	22,408,000	1,055,000	85,226,000	$2,395,000	2.8	13,699,000	18,557,000		35,632,000	7,719,000	11.4	175,522,000	11,169,000	6.4
Michigan	664,000	70,000							1,056,000	173,000	16.4	1,720,000	243,000	14.1
Mississippi	6,000	400					239,000		806,000	196,000	18.8	1,051,000	196,400	18.7
Missouri	3,000	400				2,422,000	966,000	(1)	[2] 13,573,000	3,120,000	18.4	16,964,000	3,120,400	18.4
Montana	704,000	76,000	684,000	14,000	2.0	146,000	592,000		2,304,000	586,000	19.3	4,430,000	676,000	15.3
Nebraska							263,000	(1)	[2] 655,000	178,000	19.4	918,000	178,000	19.4
New Mexico	3,142,000	134,000				4,000	250,000		111,000	100,000	27.4	3,507,000	234,000	6.7
New York	499,000	171,000				200,000	25,000		1,352.000	957,000	60.7	2,076,000	1,128,000	54.3
Ohio	5,203,000	1,256,000				12,000	4,275,000		25,447,000	13,405,000	45.1	34,937,000	14,661,000	42.0
Oklahoma	248,870,000	16,255,000	(1)	(1)	(1)	11,664,000	6,678,000	(1)	[2] [4] 25,433,000	[4] 5,721,000	13.1	292,645,000	21,976,000	7.5
Pennsylvania	6,290,000	2,091,000				1,121,000	62,000		48,771,000	17,780,000	35.6	56,244,000	19,871,000	35.3
South Dakota								(1)	[2] 1,733,000	309,000	17.8	1,733,000	309,000	17.8
Tennessee							3,856,000		1,232,000	944,000	18.6	5,088,000	944,000	18.6
Texas	163,506,000	15,404,000	176,418,000	3,441,000	2.0	25,792,000	43,885,000	11,162,000	64,339,000	24,697,000	17.0	485,102,000	43,542,000	9.0
Utah			392,000	8,000	2.0				2,586,000	425,000	16.4	2,978,000	433,000	14.5
West Virginia	13,379,000	2,871,000	(1)	(1)	(1)	1,653,000	94,000		[4] 23,932,000	[4] 7,058,000	27.5	39,058,000	9,929,000	25.4
Wyoming	18,908,000	747,000	(1)	(1)	(1)	10,488,000	194,000		[4] 7,112,000	[4] 1,104,000	6.2	36,702,000	1,851,000	5.0
Other States [6]	2,000	200	3,905,000	144,000	3.7			20,445,000	204,000	56,000	27.5	206,000	56,200	27.3
	723,165,000	59,118,000	266,625,000	6,002,000	2.3	98,842,000	120,290,000	41.256,000	315,059,000	111,226,000	19.3	1,565,237,000	176,346,000	11.3

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[1] Included under "Other States" for United States total and under "Other industrial" for State total to avoid disclosing figures of individual operators.

[2] Includes gas used at cement plants.

[4] Includes gas consumed in manufacture of carbon black.

[6] Alaska, Maryland and North Dakota.

Because of the great amount of interest manifested in the displacement of coal by natural gas it was decided to present herewith a generalized table showing the trends in consumption of these two fuels from 1925 to 1930. To obtain a better comparison between the consumption of coal and natural gas the coal-producing States were divided into two classes—those which produced at least 1 per cent of the total and the other States. The important coal-producing States are Alabama, Colorado, Illinois, Indiana, Kentucky, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and Wyoming. These 11 States would be expected to offer the greatest resistance to the encroachment of natural gas.

The domestic consumption of natural gas in the important coal States increased only 7 per cent between 1925 and 1930, whereas the domestic consumption in the other States gained 98 per cent in the same period. This indicates that coal offers considerable competition to the use of natural gas in homes. The industrial consumption of natural gas in the large coal States, excluding consumption in the field, at refineries, at public-utility power plants, and at carbon-black plants, has increased 33 per cent in the last six years, whereas the consumption of bituminous coal for industrial purposes in those States has declined about 10 per cent in the same period. On the other hand, sales of natural gas to industrial consumers in other than the important coal-producing States has gained 88 per cent in the last six years, indicating that the natural-gas industry has found it far easier to sell to industrial consumers in its own territory than to attempt to compete with coal near the mines. The quantity of natural gas utilized for industrial purposes in the important coal States in 1930 amounted to 130,000,000,000 cubic feet. It is calculated[3] that this is equivalent to about 7,200,000 short tons of bituminous coal, a much lower figure than is commonly supposed.

Competition with coal influences the price of natural gas, particularly the price for industrial consumption. Some industries are practically dependent on natural gas as fuel, but the majority could utilize coal or oil. In the last five years the average values of both bituminous coal and natural gas used for industrial purposes have declined 17 per cent, indicating considerable competition between the two fuels.

On the other hand, the use of natural gas for domestic consumption presents an entirely different picture. The price of natural gas for home consumption has increased steadily in recent years, one of the few instances where the price of a fuel has risen.

Natural gas possesses certain advantages over coal for consumption in homes, these being interpreted, in general, in the differential between the prices of the two fuels. If the present trend continues, this price differential may become so great as to cause the less wealthy classes of people to change from natural gas to coal and may result in a decline in demand for natural gas. The possible decline of demand may be then met by a drop in price.

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[3] These calculations are based on the following data: Natural gas, 1,000 B. t. u. per cubic foot, 80 per cent efficient; coal, 13,000 B. t. u. per pound, 55 per cent efficient.

Summary of statistics for natural gas and bituminous coal, 1925–1930

Year	Natural gas								Bituminous coal			
	Domestic consumption (billions of cubic feet)			Industrial consumption[1] (billions of cubic feet)			Average value (cents per M cubic feet)		Production [2] (millions of short tons)			Average value per short ton
	Large coal-producing States [3]	Other natural gas-consuming States	Total	Large coal-producing States [3]	Other natural gas-consuming States	Total	Domestic	Industrial	Large coal-producing States [3]	Other coal-producing States	Total	
1925	178	94	272	98	120	218	56.0	19.4	486	34	520	$2.04
1926	186	103	289	100	140	240	58.4	23.2	538	35	573	2.06
1927	174	122	296	108	162	270	60.8	20.8	483	35	518	1.99
1928	182	139	321	114	192	306	62.0	20.5	466	35	501	1.86
1929	186	174	360	142	232	374	62.0	19.7	498	37	535	1.78
1930	190	186	376	130	226	356	63.5	19.3	436	32	468	1.70
	[4] +7	[4] +98	[4] +38	[4] +33	[4] +88	[4] +63	[4] +13	[4] −1	[4] −10	[4] −8	[4] −10	[4] −17

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[1] Excluding consumption in the field, at refineries, at public-utility power plants, and at carbon-black plants.

[2] Complete data for coal consumption by States not available; in general, total coal consumption equals production minus 15,000,000 tons exported.

[3] Alabama, Colorado, Illinois, Indiana, Kentucky, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and Wyoming.

[4] Per cent of change in 1930 compared with 1925.

INTERSTATE TRANSPORTATION

The interstate transportation of natural gas has shown a rapid growth in recent years, particularly in 1929, when several large lines traversing various States were completed. In 1930 the growth in interstate deliveries was more conservative; nevertheless, the quantity transported between States showed a gain of 17 per cent over 1929 and amounted to 380,601,000,000 cubic feet in 1930. (See fig. 10.)

The largest single interstate movement of gas was again that from West Virginia to Ohio, although the movement from Oklahoma to Kansas was almost as large. Other important interstate deliveries were those from Kansas to Missouri, from Kentucky to West Virginia, from Louisiana to Arkansas and Texas, from Texas to Colorado and Oklahoma, and from West Virginia to Pennsylvania. The States that have large quantities of excess gas over and above their consumption are Louisiana and West Virginia; hence, the interstate movement from these States is large. The receipts of Texas from Louisiana practically compensate for the interstate deliveries from the Panhandle; however, the major portion of the movements from Oklahoma to Kansas and from Kansas to Missouri probably consists of gas from the Panhandle, which can not be segregated in the statistics.

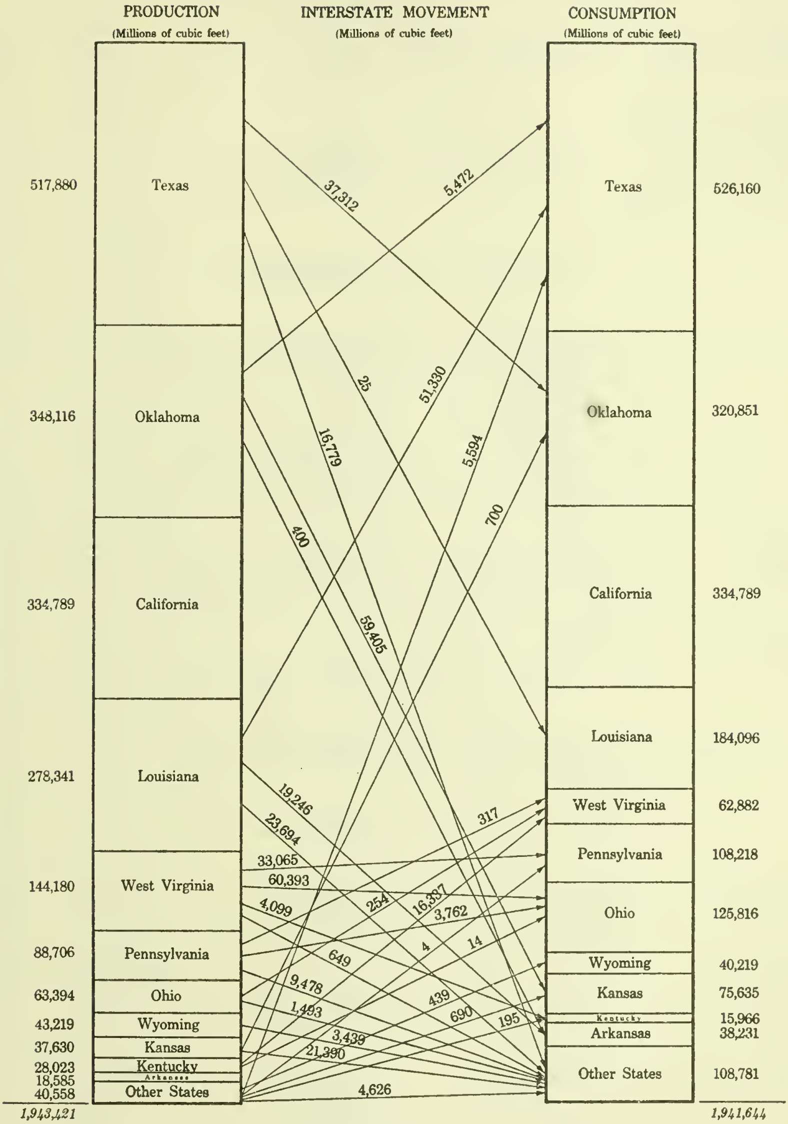
PRODUCTION
(Millions of cubic feet)
INTERSTATE MOVEMENT
(Millions of cubic feet)
CONSUMPTION
(Millions of cubic feet)
517,880
Texas
348,116
Oklahoma
334,789
California
278,341
Louisiana
144,180
West Virginia
88,706
Pennsylvania
63,394
Ohio
43,219
Wyoming
37,630
Kansas
28,023
Kentucky
18,585
Arkansas
40,558
Other States
1,943,421
37,312
5,472
25
51,330
16,779
5,594
400
700
59,405
19,246
23,694
33,065
60,393
4,099
317
254
16,337
3,762
649
4
14
9,478
1,493
439
690
195
3,439
21,390
4,626
Texas
526,160
Oklahoma
320,851
California
334,789
Louisiana
184,096
West Virginia
62,882
Pennsylvania
108,218
Ohio
125,816
Wyoming
40,219
Kansas
75,635
Kentucky
15,966
Arkansas
38,231
Other States
108,781
1,941,644

FIGURE 10.—Interstate movement of natural gas in the United States in 1930 and relative importance of principal States in production and consumption

Interstate transportation of natural gas, 1929 and 1930, in thousands of cubic feet [1]

State from which gas was transported	State through which gas was transported	State to which gas was transported	1929	1930
Arkansas		Oklahoma	16,000	
Colorado	Wyoming	Utah	228,000	1,287,000
		Wyoming	851,000	439,000
			1,079,000	1,726,000
Indiana		Kentucky	265,000	195,000
Kansas	Nebraska	Iowa		8,000
		Missouri	14,635,000	20,284,000
		Nebraska		1,098,000
		Oklahoma	169,000	700,000
			14,804,000	22,090,000
Kentucky		Ohio		14,000
		West Virginia	12,820,000	16,337,000
			12,820,000	16,351,000
Louisiana	Mississippi	Alabama		1,155,000
		Arkansas	19,401,000	19,246,000
	Mississippi Alabama	Georgia		1,497,000
	Arkansas Missouri	Illinois	156,000	6,712,000
		Mississippi	484,000	1,556,000
	Arkansas	Missouri	133,000	5,464,000
	Arkansas Mississippi	Tennessee	5,370,000	7,310,000
		Texas	34,824,000	51,330,000
			60,368,000	94,270,000
Missouri		Kansas	14,000	690,000
Montana		North Dakota	90,000	283,000
		South Dakota	1,618,000	2,807,000
			1,708,000	3,090,000
New Mexico		Colorado	91,000	142,000
		Texas	2,016,000	5,594,000
			2,107,000	5,736,000
New York		Canada	103,000	107,000
		Pennsylvania	103,000	4,000
			206,000	111,000
Ohio		Indiana	1,618,000	1,493,000
		West Virginia	734,000	254,000
			2,352,000	1,747,000
Oklahoma		Arkansas	445,000	400,000
		Kansas	51,797,000	59,405,000
		Texas	7,698,000	5,472,000
			59,940,000	65,277,000
Pennsylvania		New York	10,011,000	9,478,000
		Ohio	1,071,000	3,762,000
		West Virginia	2,645,000	317,000
			13,727,000	13,557,000
Texas	New Mexico	Colorado	12,563,000	14,914,000
		Louisiana	7,000	25,000
		Mexico	139,000	1,691,000
		New Mexico	74,000	174,000
		Oklahoma	31,157,000	37,312,000
			43,940,000	54,116,000

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[1] In general the gas is produced in the State from which it is listed as transported.

Interstate transportation of natural gas, 1929 and 1930, in thousands of cubic feet—Continued

State from which gas was transported	State through which gas was transported	State to which gas was transported	1929	1930
West Virginia		Kentucky	4,411,000	4,099,000
		Maryland	740,000	649,000
		Ohio	69,976,000	60,393,000
		Pennsylvania	34,549,000	33,065,000
			109,676,000	98,206,000
Wyoming		Montana	1,381,000	1,074,000
		Utah	618,000	2,365,000
			1,999,000	3,439,000
			325,021,000	380,601,000

NATURAL-GAS WELLS

The approximate number of gas wells operated in 1930 totaled 55,020, an increase of 1,475 over 1929. The total number of gas wells completed in 1930 amounted to 2,866, so that about 1,400 gas wells were abandoned during the year. These data do not include the 331,070 oil wells that were producing on December 31, 1930, of which the majority produce enough gas to justify the effort to save it. Pennsylvania, with nearly 20,000 gas wells in 1930, again ranked first; and West Virginia, with close to 13,000 gas wells, was again second. The small average size of the wells in the Eastern States makes it imperative, on account of the large distribution, to have a great number upon which to draw and necessitates the drilling of many new wells. Thus, while the States east of the Mississippi produced only 18 per cent of the total output in 1930, they had 81 per cent of the gas wells operating during 1930 and were credited with 51 per cent of all the gas wells brought in during the year.

The number of gas wells completed during 1930 amounted to 2,866, a decrease of 4 from the total in 1929. This figure does not include completions in California, for which State the record is lacking. However, the number of strictly gas wells in California is comparatively small.

Ohio, with 653 in 1930, was again the leading State in number of gas-well completions. This figure represents a material decline from 1929; nevertheless, the State showed a gain of 9 per cent in output. Texas, Oklahoma, and West Virginia, with 483, 403, and 397 completions, respectively, followed Ohio in rank. Of these only Texas showed an increase in production over 1929.

Approximate number of gas wells operated in the United States, 1929 and 1930

State	1929	1930	State	1929	1930
Arkansas	150	162	Michigan	25	27
California	75	50	Montana	140	175
Colorado, New Mexico, Utah, and Washington	40	50	New York	2,150	2,134
Illinois	85	88	Ohio	6,500	6,849
Indiana	1,110	1,134	Oklahoma	3,060	3,217
Iowa, Missouri, North Dakota, and South Dakota	20	121	Pennsylvania	19,770	19,764
Kansas	3,930	3,992	Texas	1,500	1,514
Kentucky and Tennessee	1,240	1,402	West Virginia	12,600	12,983
Louisiana and Mississippi	1,030	1,266	Wyoming	120	92
				53,545	55,020

Gas wells drilled in the United States in 1930, by States and by counties or districts [1]

State and county or district	Number of gas wells
Arkansas:	
Franklin	1
Johnson	2
Pope	2
Sebastian	6
Union	1
	12
Total for 1929	19
California	(2)
Colorado:	
Archuleta	1
Garfield	1
Larimer	1
Las Animas	1
Moffat	3
Montezuma	2
Rio Blanco	1
	10
Total for 1929	5
Illinois:	
Crawford	2
Wabash	1
	3
Total for 1929	2
Indiana:	
Crawford	1
Daviess	2
Decatur	6
Gibson	3
Hancock	4
Harrison	4
Huntington	2
Jay	1
Knox	1
Madison	1
Marion	1
Monroe	1
Perry	3
Pike	20
Porter	1
Sullivan	3
Vanderburg	1
	55
Total for 1929	36
Kansas:	
Barber	3
Chautauqua	5
Coffey	1
Cowley	21
Edwards	2
Elk	2
Franklin	2
Grant	1
Greenwood	4
McPherson	10
Marion	1
Montgomery	1
Morris	3
Morton	26
Reno	2
Rice	2
Rush	1
Sedgwick	1
Stevens	77
Sumner	1
Woodson	2
	168
Total for 1929	52
Kentucky:	
Barren	9
Bell	2
Christian	1
Clay	5
Cumberland	1
Daviess	9
Green	1
Hancock	11
Hart	13
Henderson	14
Hopkins	1
Jackson	1
Johnson-Magoffin	1
Knox	3
McLean	2
Metcalfe	10
Muhlenberg	5
Ohio	62
Perry	1
Pike	1
Webster	4
	157
Total for 1929	82
Louisiana:	
Gulf coast	1
	1
Total for 1929	6
Northern—	
Bienville	4
Bossier	23
Caddo	7
Claiborne	5
De Soto	5
East Carroll	1
Morehouse	23
Ouachita	43
Red River	1
Richland	104
Sabine	6
Union	29
Webster	3
	254
Total for 1929	281
Total Louisiana, 1930	255
1929	287
Michigan:	
Clare	4
Isabella	11
Livingston	1
Manistee	3
Mason	1
Muskegon	7
Newaygo	1
Ottawa	1
	29
Total for 1929	31
Mississippi:	
Hinds	16
Rankin	15
	31
Total for 1929	1
Montana:	
Big Horn	6
Border	1
Fallon	16
Montana—Continued.	
Glacier	2
Kevin-Sunburst	12
Rosebud	1
Toole	2
	40
Total for 1929	66
New Mexico:	
Eddy	6
Lea	2
San Juan	3
	11
Total for 1929	16
Ohio:	
Central and Eastern—	
Ashland	45
Athens	77
Belmont	16
Coshocton	21
Fairfield	8
Guernsey	8
Holmes	20
Knox	31
Licking	19
Lorain	26
Medina	24
Meigs	18
Muskingum	89
Perry	20
Stark	16
Summit	42
Tuscarawas	32
Wayne	31
Miscellaneous	38
	581
Total for 1929	776
Northwestern—	
Hancock	3
Hardin	36
Henry	1
Huron	3
Logan	1
Mercer	3
Ottawa	2
Sandusky	7
Seneca	10
Wyandot	6
	72
Total for 1929	25
Total Ohio, 1930	653
1929	801
Oklahoma:	
Beckham	3
Caddo	7
Carter	1
Cotton	1
Craig	1
Creek	38
Garfield	2
Grady	15
Grant	7
Harper	1
Hughes	22
Kay	10
Latimer	6
Le Flore	3
Lincoln	6
Logan	1

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[1] Oil and Gas Journal.

[2] California not reported.

Gas wells drilled in the United States in 1930, by States and by counties or districts—Continued

State and county or district	Number of gas wells
Oklahoma—Continued.	
McIntosh	4
Muskogee	49
Noble	5
Nowata	1
Okfuskee	16
Oklahoma	23
Okmulgee	32
Osage	28
Pawnee	11
Payne	5
Pittsburg	23
Pontotoc	1
Pottawatomie	3
Seminole	38
Sequoyah	1
Stephens	8
Texas	2
Tulsa	4
Wagoner	24
Washington	1
	403
Total for 1929	369
Pennsylvania and New York:	
Allegany	2
Bradford	2
Butler-Armstrong	17
Middlefield	4
Venango-Clarion	37
Southwestern Pennsylvania	67
	129
Total for 1929	116
Tennessee:	
Dickson	1
Lincoln	1
Morgan	5
Overton	2
Putnam	2
Smith	1
	12
Total for 1929	------
Texas:	
Gulf coast—	
Clay Creek	1
De Walt	1
Esperson	1
High Island	1
Hull	1
Humble	1
Pierce Junction	1
Raccoon Bend	1
Texas—Continued.	
Gulf coast—Continued.	
Refugio	26
Saratoga	1
Spindletop	4
Miscellaneous	4
	43
Total for 1929	58
Rest of State—	
Northern, Central, Eastern, and Southwestern—	
Anderson	5
Brown	12
Callahan	11
Clay	1
Coleman	17
Comanche	8
Dobrowski	3
Eastland	25
Erath	11
Foard	1
Harrison	1
Haskell	1
Jack	3
Kingsville	1
Lasater	2
Mirando	46
Montague	1
Nursery	1
Palo Pinto	16
Panola	28
Pettus	9
Saxet	3
Shackelford	3
Stephens	18
Throckmorton	2
Van Zandt	1
White Point	1
Young	3
Miscellaneous	29
	263
Total for 1929	370
Panhandle—	
Carson	36
Gray	30
Hartley	1
Hutchinson	17
Moore	9
Potter	6
Wheeler	73
	172
Total for 1929	139
Texas—Continued.	
Rest of State—Con.	
West Texas—	
Ector	1
Pecos	3
Taylor	1
	5
Total for 1929	12
Total "Rest of State,"	
1930	440
1929	521
Total Texas, 1930	483
1929	579
Utah:	
Carbon	1
	1
Total for 1929	------
West Virginia:	
Boone	68
Cabell	24
Calhoun	47
Clay	10
Doddridge	9
Gilmer	20
Harrison	7
Kanawha	30
Lewis	7
Lincoln	17
Marion	21
Marshall	23
Mingo	7
Monongalia	8
Ritchie	23
Roane	28
Wayne	10
Wetzel-Tyler	21
Miscellaneous	17
	397
Total for 1929	399
Wyoming:	
Big Horn	2
Carbon	1
Fremont	3
Natrona	1
Park	3
Sweetwater	7
	17
Total for 1929	9
Total United States, 1930	[3] 2,866
1929	[3] 2,870

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[3] Exclusive of California.

SURVEY OF NATURAL-GAS PIPE LINES

It is difficult to estimate the total mileage of the natural-gas pipe lines, chiefly because there is no definite dividing line between trunk and gathering lines. Furthermore, it is virtually impossible to ascertain when work on new lines was started and completed. However, it is believed that on July 1, 1931, there were approximately 50,000 miles of natural-gas trunk lines in the United States, as compared with 40,000 miles the previous year.

Although the number of large pipe-line systems completed in 1930 probably fell below the record for 1929 the number of individual projects undoubtedly showed an increase, and the total mileage laid possibly was higher than in 1929.

The most important project in the Eastern States in 1930 was the construction of a pipe line running from Kentucky to Baltimore, and possibly Philadelphia, via Washington, D. C. This system was due to be completed late in 1931; meanwhile, the city of Washington has been receiving natural gas for some time from West Virginia through the northern end of the system. The system between the Monroe-Richland district and Atlanta, Birmingham, Montgomery, and other cities was completed in 1930 except for the construction of a number of branch lines. Work on the three large projects that will eventually serve Omaha-Des Moines-Minneapolis, Chicago, and Indianapolis, with branches to other cities, was continued during the year. All of these systems originate in the Texas Panhandle field, but the line to Omaha and Des Moines will have a connection with the Hugoton field of Kansas. Considerable pipe-line work was done in Montana and North Dakota incident to the construction of lines to Williston, Bismarck, Shelby, and Billings. The pipe-line facilities between the Kettleman Hills field and San Francisco and Los Angeles were materially augmented during the year. Work was begun or completed on natural-gas pipe-line systems from points in Kansas to cities in southern Nebraska and on a 12-inch line between the gas fields of northwest New Mexico and the cities of Albuquerque and Santa Fe. The 16-inch line to Monterrey, Mexico. was placed in operation early in the year and caused a sharp increase in exports of natural gas to Mexico. The many plans to pipe natural gas to the mining districts in southern Arizona were climaxed when actual work was begun on a line to Bisbee and Douglas, Ariz., and Cananea, Mexico, late in the year. This line will be a continuation of the system between Lea County, N. Mex., and El Paso, Tex.

SUMMARY OF STATISTICS FOR NATURAL GASOLINE AND CARBON BLACK

Because of the close relationship between the natural-gas, natural-gasoline, and carbon-black industries, it was thought advisable to include in this report summary tables for the natural-gasoline and carbon-black industries. Complete details for those commodities will be found in the annual chapters on those subjects in Mineral Resources of the United States.

Summary of statistics for natural gasoline in the United States, 1925–1930

	1925	1926	1927	1928	1929	1930
Number of plants operating	1,081	1,102	1,119	1,078	1,087	1,035
Production:						
By States—						
California millions of gallons	303	389	498	584	840	830
Oklahoma do	391	476	548	620	676	591
Texas do	214	243	321	324	420	491
Louisiana do	43	44	45	55	65	74
West Virginia do	58	64	64	70	73	63
Other do	118	147	165	161	160	161
	1,127	1,363	1,641	1,814	2,234	2,210
By types of process—						
Compression process do	238	243	242	226	259	250
Absorption and combination processes millions of gallons	882	1,100	1,377	1,564	1,950	1,942
Charcoal do	7	20	22	24	25	18
	1,127	1,363	1,641	1,814	2,234	2,210
Stocks at natural-gasoline plants Dec. 31 millions of gallons	15	19	32	27	26	24
Value:						
Total (at plants) millions of dollars	120	136	119	139	158	128
Average per gallon (at plant) cents	10.7	10.0	7.2	7.7	7.1	5.8
Average spot price, Oklahoma natural gasoline, grade A cents	12.0	9.5	5.9	7.4	7.1	5.4
Natural gas treated millions of cubic feet	1,040,390	1,206,300	1,341,248	1,473,434	1,959,294	2,088,778
Average yield per thousand cubic feet gallons	1.08	1.13	1.22	1.23	1.14	1.06

Summary of statistics for carbon black made from natural gas in the United States, 1926–1930

	1926	1927	1928	1929	1930
Number of producers reporting	33	33	31	35	33
Number of plants	62	61	65	71	69
Quantity produced:					
By States—					
Kentucky pounds	6,309,826	5,669,000	484,000	----------	----------
Louisiana do	130,376,987	124,188,000	136,320,000	127,345,000	96,729,000
Texas do	36,328,052	56,396,000	100,828,000	228,183,000	271,749,000
West Virginia do	3,804,586	2,796,000	697,000	578,000	(1)
Wyoming do	(1)	6,294,000	(1)	(1)	(1)
Other States do	3,756,725	3,086,000	10,461,000	10,336,000	11,464,000
	180,576,176	198,429,000	248,790,000	366,442,000	379,942,000
By processes—					
Channel process do	152,300,410	167,357,000	220,532,000	327,552,000	350,254,000
Other processes[2] do	28,275,766	31,072,000	28,258,000	38,890,000	29,688,000
Stocks held by producers Dec. 31 do	108,378,101	82,831,000	50,240,000	132,203,000	259,245,000
Losses do	716,813	546,000	802,000	673,000	1,361,000
Quantity sold:					
Domestic—					
To rubber companies do	(3)	(3)	140,938,000	138,474,000	128,572,000
To ink companies do	(3)	(3)	27,223,000	27,350,000	19,220,000
To paint companies do	(3)	(3)	20,040,000	17,257,000	11,922,000
For miscellaneous purposes do	(3)	(3)	14,475,000	8,896,000	7,565,000
	128,294,321	168,999,000	202,676,000	191,977,000	167,279,000
Export do	39,210,389	54,431,000	77,903,000	91,829,000	84,260,000
	167,504,710	223,430,000	280,579,000	283,806,000	251,539,000
Value (at plants) of carbon black produced:					
Total dollars	9,939,221	10,955,000	13,782,000	18,720,000	14,852,000
Average per pound cents	5.50	5.52	5.54	5.11	3.91
Estimated quantity of natural gas used M cubic feet	130,321,000	144,087,000	175,137,000	261,107,000	266,625,000
Average yield per M cubic feet pounds	1.39	1.38	1.42	1.40	1.43

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[1] Included under "Other States."
[2] Including disk, Lewis, roller, "special," and thermatomic.
[3] Figures not available.

COKE AND BY-PRODUCTS[1]

By Walter H. Voskuil, F. G. Tryon, and H. L. Bennit

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REVIEW OF INDUSTRY IN 1930

The coke industry in 1930 shared the industrial depression which began in 1929 and continued with increasing severity throughout

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[1] Work on manuscript completed October, 1931.

1930. Production fell to 47,972,021 tons, a decrease of 11,911,824 tons, or 19.9 per cent below the 1929 level. Output declined, almost consistently, from month to month and was over 1,200,000 tons less in December than in January. The decline in production was accompanied by an increase in stocks of approximately 1,000,000 tons. (See figs. 11 and 12.)

Exports of coke declined slightly in 1930 below the level of the preceding year, most of the decrease occurring in shipments to Canada.

The demand for coke fell off among all consuming groups except domestic fuel users. Curtailment of consumption was especially severe in the metallurgical industries, which consumed less than in any year since 1921 and 1922. Consumption for domestic uses rose to new high levels, indicating, as in earlier years, that future expansion of coke consumption depends largely on the household fuel market.

The year was marked by a sharp decline in output of beehive coke. Although the total output of coke declined 19.9 per cent, beehive coke decreased 57.1 per cent below the 1929 and 38.2 per cent below the 1928 levels, the previous low record for this branch of the industry.

The higher production of beehive coke in 1929, as compared with 1930, resulted from unusually heavy operations in the iron and steel industry in the earlier year. Lack of a summer let-down in blast-furnace operations made necessary the firing of a number of beehive ovens by steel-making interests. The recession of blast-furnace activity in 1930 resulted in the closing of more than half of these ovens.

The declining importance of beehive coke was reflected in a further large reduction in the number of beehive ovens. On the contrary, the number of by-product ovens continued to increase. On December 31, 1930, 276 by-product ovens were under construction.

Spot prices of coking coals, f. o. b. mines, showed a slight decline from the previous year. The average cost of coal charged into by-product ovens, which has been falling since 1923, was $3.57 in 1928, $3.50 in 1929, and $3.48 in 1930. (See fig. 13.)

The market for by-products in 1930 continued the tendencies apparent in the last five years. The yield of by-products per ton of coal carbonized advanced over that in 1929 and previous years, although less rapidly than heretofore. (See fig. 23, p. 560.) Receipts per gallon of tar increased in 1930, and receipts per gallon of benzol and per pound of ammonium sulphate continued to decline. (See fig. 24, p. 562.) Gas remains by far the most important by-product. The gross return for by-product gas in 1930 was $1.754 per ton of coke produced, the highest amount since records are available. The total value of all by-products combined per ton of coke produced was $3.71, also an increase over previous years.

A significant development in by-product manufacture is the rapid expansion of creosote oil recovery. The total output of this product rose from 12,386,000 gallons in 1928 to 25,679,882 gallons in 1930.

Prices of all grades of coke continued to decline in 1930 from the levels of previous years. The average realization on merchant sales of by-product furnace coke, for example, declined from $5.38 in 1929 to $4.95 in 1930; in the same period foundry coke declined from $6.97 to $6.57 and domestic coke from $6.28 to $6.03. In part, these decreases reflected the declining cost of coking coal, but they also

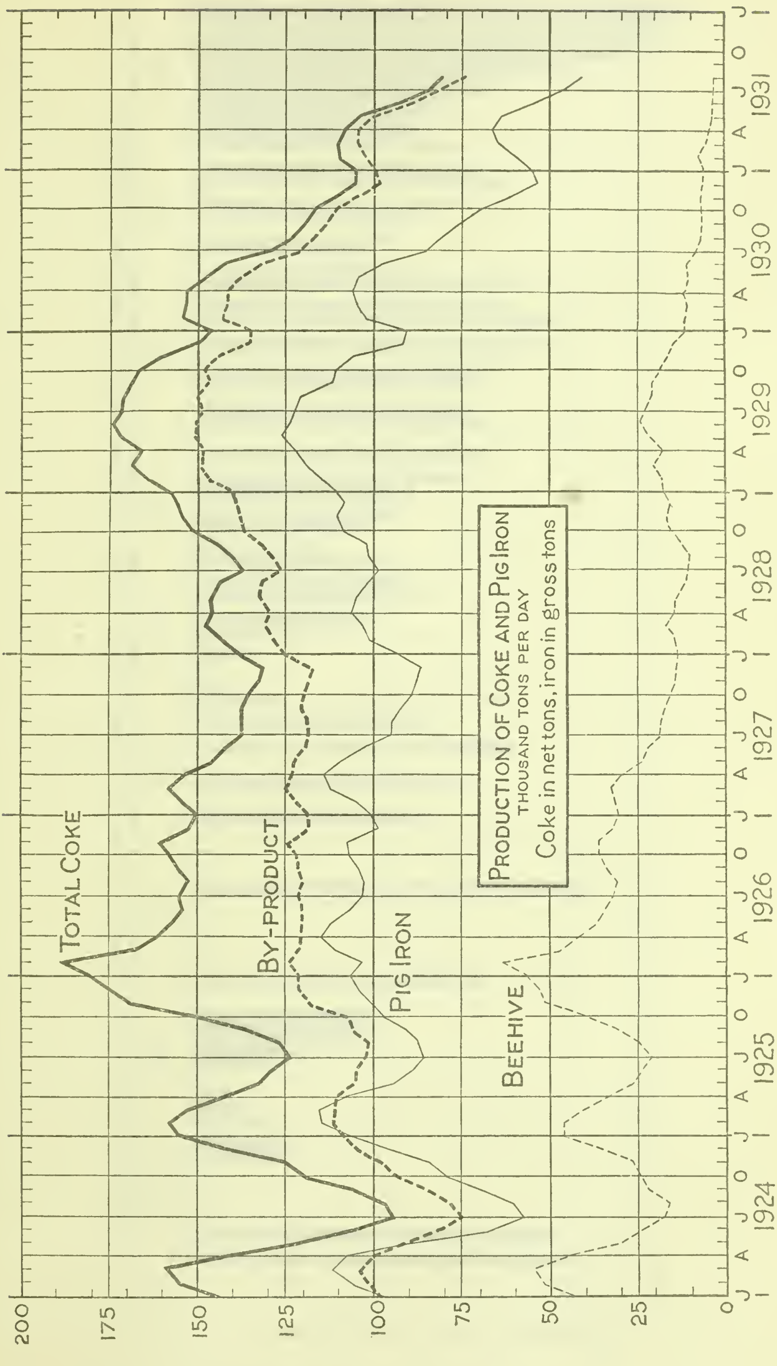

FIGURE 11.—Average daily production of beehive and by-product coke and pig iron, by months, 1924–1931

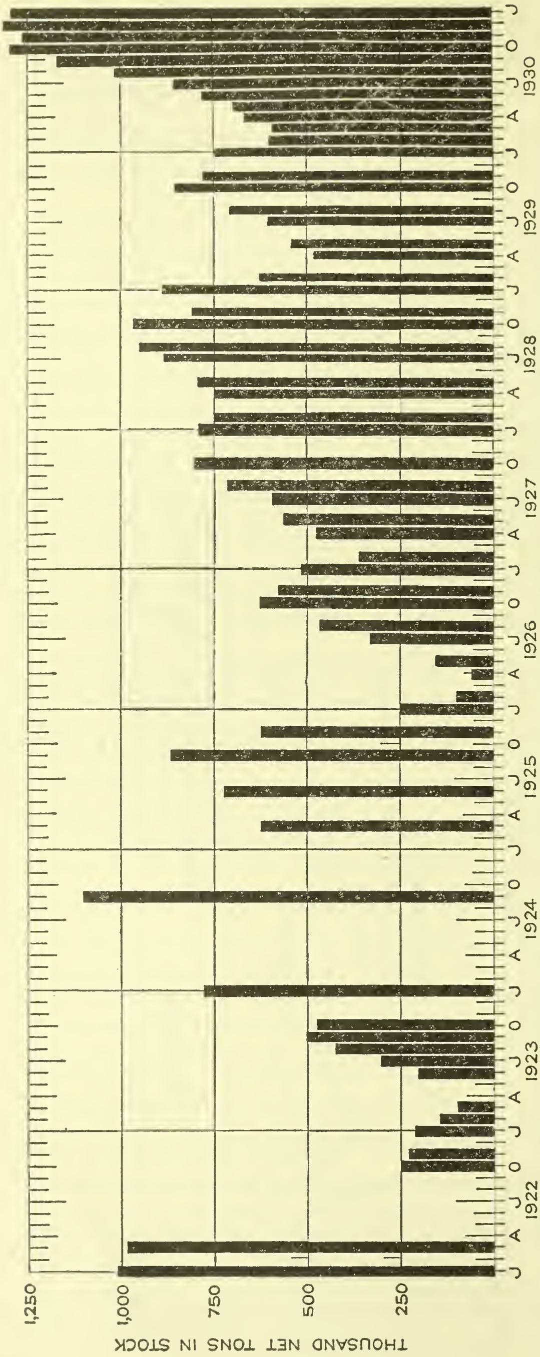

FIGURE. 12.—Stocks of unsold coke on hand at a group of 21 merchant by-product plants, 1922-1930. The figures in this diagram represent a selected group of identical plants only, which have been reporting their stocks since 1922. They are therefore less than the total for all plants shown in Figure 9

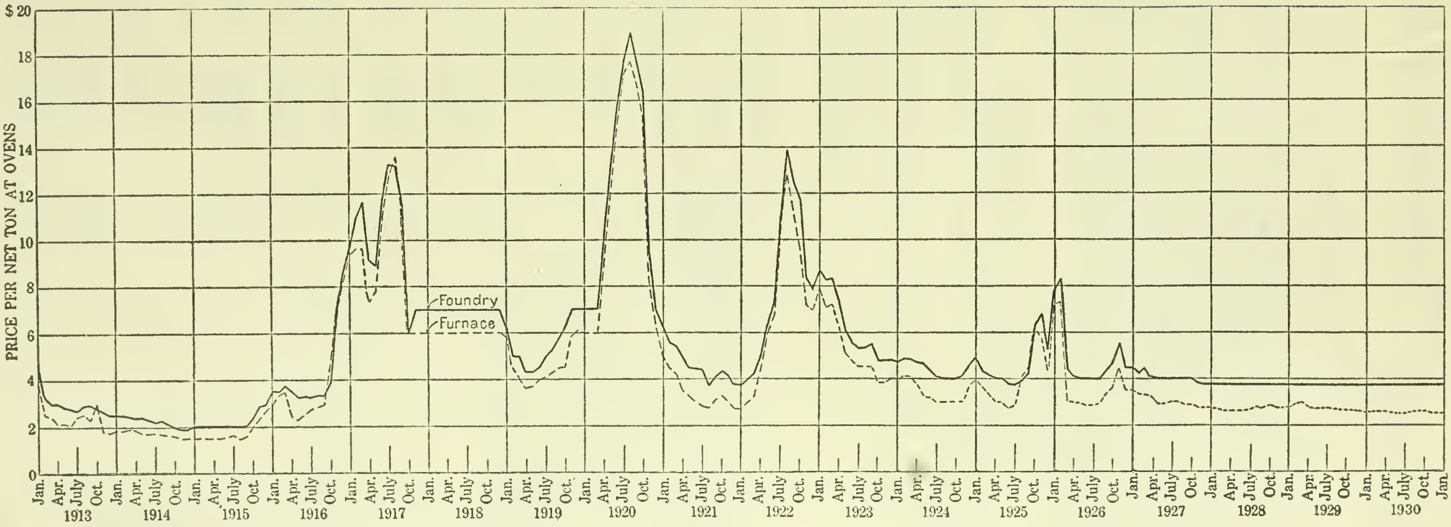

FIGURE 13.—Average monthly prices of spot or prompt Connellsville coke at ovens, 1913–1930, as quoted by Iron Age

reflected the sharp recession in metallurgical operation. Sales of domestic by-product coke rose to 7,886,432 tons in 1930, an increase of 510,112 tons over 1929.

ACKNOWLEDGMENTS

This report is based upon voluntary statistical returns by the producers of coke, for whose generous and continuing assistance thanks are cordially extended. Special mention should be made of the courtesy of operators of by-product coke plants in supplying monthly returns of coke output. The railroads have furnished weekly reports of cars of beehive coke loaded, which have been indispensable in preparing the current estimates of production of beehive coke and bituminous coal, and the United States Engineer Office has courteously supplied monthly reports of shipments on the Monongahela River and other waterways.

STATISTICAL SUMMARY

Tables 1, 2, and 3 present the principal statistical facts of the coke industry in 1930.

TABLE 1.—*Salient statistics of the coke industry in 1930*

	By-product	Beehive	Total
Coke produced:			
Quantity...net tons	45,195,705	2,776,316	47,972,021
Value	$199,623,905	$9,513,357	$209,137,262
Screenings and breeze produced:			
Quantity...net tons	4,337,112	85,622	4,422,734
Value	$9,408,549	$59,166	$9,467,715
Coal charged into ovens:			
Quantity...net tons	65,521,321	4,284,144	69,805,465
Value	$227,787,775	$7,058,789	$234,846,564
Average value	$3.48	$1.65	$3.36
Average yield in per cent of coal charged:			
Coke	68.98	64.80	68.72
Breeze (at plants actually recovering)	6.62	3.95	6.53
Ovens:			
In existence Jan. 1	12,649	30,082	42,731
In existence Dec. 31	12,831	23,907	36,738
Dismantled during year	411	6,503	6,914
In course of construction Dec. 31	276	----------	276
Daily capacity of ovens in existence Dec. 31...net tons	168,405	(1)	(1)
Coke used by operator:			
In blast furnaces—			
Quantity...do	27,991,612	157,300	28,148,912
Value	$118,682,215	$681,504	$119,363,719
For other purposes—			
Quantity...net tons	1,483,988	2,886	1,486,874
Value	$9,220,983	$11,506	$9,232,489
Disposal of coke:			
Sold for furnace use to affiliated corporations—			
Quantity...net tons	2,296,484	391,523	2,688,007
Value	$11,077,820	$1,418,527	$12,496,347
Merchant sales of furnace coke—			
Quantity...net tons	1,125,503	1,075,258	2,200,761
Value	$5,576,847	$3,130,425	$8,707,272
Sold for foundry use—			
Quantity...net tons	1,601,266	526,449	2,127,715
Value	$10,517,044	$2,204,847	$12,721,891
Sold for domestic use—			
Quantity...net tons	7,886,432	141,391	8,027,823
Value	$47,569,744	$473,762	$48,043,506
Sold for industrial and other use—			
Quantity...net tons	1,550,020	480,083	2,030,103
Value	$9,117,349	$1,586,132	$10,703,481
Disposal of screenings and breeze:			
Used by operator—			
Quantity...net tons	3,558,828	61,081	3,619,909
Value	$7,031,483	$31,641	$7,063,124
Sold—			
Quantity...net tons	841,582	16,623	858,205
Value	$2,331,016	$22,414	$2,353,430

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[1] Data not available.

TABLE 1.—*Salient statistics of the coke industry in 1930*—Continued

	By-product	Beehive	Total
Average receipts per ton sold:			
Furnace coke (merchant sales)	$4.95	$2.91	$3.96
Foundry coke	$6.57	$4.19	$5.98
Domestic coke	$6.03	$3.35	$5.98
Other industrial coke	$5.88	$3.30	$5.27
Screenings and breeze	$2.77	$1.35	$2.74
By-products produced:			
Gas ... M cubic feet	724,103,004		724,103,004
Wasted ... per cent	2.3		2.3
Burned in coking process ... do	36.7		36.7
Surplus sold or used ... do	61.0		61.0
Tar ... gallons	602,485,929		602,485,929
Ammonium sulphate or equivalent ... pounds	1,538,044,492		1,538,044,492
Crude light oil ... gallons	178,325,952		178,325,952
Yield of by-products per ton of coal:			
Gas ... M cubic feet	11.05		11.05
Tar ... gallons	9.20		9.20
Ammonium sulphate or equivalent ... pounds	23.47		23.47
Crude light oil ... gallons	3.06		3.06
Value of by-products sold:			
Gas (surplus)	$79,294,137		$79,294,137
Tar—			
Sold	15,562,963		15,562,963
Used by producer	14,093,411		14,093,411
Ammonium sulphate or equivalent	22,684,696		22,684,696
Crude light oil and derivatives	23,654,890		23,654,890
Other by-products [2]	2,897,035		2,897,035
Total value of coke, breeze, and by-products [3]	367,219,586	$9,572,523	376,792,109

[2] Includes naphthalene and tar derivatives.

[3] Includes value of tar used by the coke plants.

TABLE 2.—*Statistical trends of the coke industry, 1915, 1923, and 1927–1930*

	1915	1923	1927	1928	1929	1930
Coke produced:						
Beehive ... net tons	27,508,255	19,379,870	7,207,417	4,492,803	6,472,019	2,776,316
By-product ... do	14,072,895	37,597,664	43,884,726	48,313,025	53,411,826	45,195,705
Total ... do	41,581,150	56,977,534	51,092,143	52,805,828	59,883,845	47,972,021
Per cent of total from by-product ovens	33.8	66.0	85.9	91.5	89.2	94.2
Disposal of coke (beehive and by-product):						
Furnace coke (including all coke used by producer) ... net tons	(1)	47,774,408	40,317,130	41,952,336	46,785,722	34,524,554
Foundry coke ... do	(1)	3,600,719	2,748,243	2,710,606	2,888,508	2,127,715
Other industrial ... do	(1)	2,283,888	2,592,587	1,764,374	2,334,999	2,030,103
Domestic coke ... do	(1)	2,733,414	4,813,632	6,332,720	7,511,023	8,027,823
Number of ovens in existence:						
Beehive	93,110	62,349	49,795	46,288	30,082	23,907
By-product	6,268	11,156	12,475	12,544	12,649	12,831
Number of new by-product ovens under construction at end of year	1,191	629	289	145	408	276
Cost of coal charged, by-product ovens, average per ton	$2.33	$4.76	$3.87	$3.57	$3.50	$3.48
Prices of coke:						
Average spot price of Connellsville furnace coke f. o. b. ovens	$1.73	$5.33	$3.04	$2.69	$2.75	$2.56
Average realization on by-product coke sold—						
Furnace coke (merchant sales)	(1)	$6.74	$5.42	$4.99	$5.38	$4.95
Foundry coke	(1)	$10.54	$7.80	$6.98	$6.97	$6.57
Other industrial	(1)	$9.06	$6.83	$6.58	$5.77	$5.88
Domestic	(1)	$9.05	$6.90	$6.23	$6.28	$6.03
Yield of by-products per ton of coal charged:						
Tar ... gallons	7.1	8.1	8.6	9.0	8.9	9.20
Ammonium sulphate or equivalent ... pounds	20.1	21.2	22.7	22.8	22.3	23.47
Light oil ... gallons	1.5	2.7	2.9	3.0	2.9	3.06
Surplus gas sold or used ... M cubic feet	4.3	5.9	6.5	6.5	6.6	6.75
Average gross receipts of by-products per ton of coke produced:						
Tar sold or used	$0.25	$0.51	$0.66	$0.69	$0.65	$0.656
Ammonia and its compounds	.70	.84	.62	.57	.54	.502
Light oil and its derivatives	.52	.51	.58	.60	.58	.527
Surplus gas sold or used	.61	1.37	1.60	1.58	1.58	1.754
Total by-products, including breeze	2.19	3.48	3.66	3.66	3.60	3.708

[1] No data.

TABLE 3.—*Summary of coke produced, value, number of ovens, coal charged, and average yield, by States, 1929 and 1930*

[Exclusive of screenings and breeze]

State	By-product								Beehive						Total	
	Plants in existence	Ovens		Coal used (net tons)	Yield of coke from coal (per cent)	Coke produced (net tons)	Value of coke at ovens		Ovens	Coal used (net tons)	Yield of coke from coal (per cent)	Coke produced (net tons)	Value of coke at ovens		Coke produced (net tons)	Value of coke at ovens
		Built	Under construction Dec. 31				Total	Per ton					Total	Per ton		
1929																
Alabama	8	1,388		6,708,774	70.9	4,753,967	$12,659,148	$2.66							4,753,967	$12,659,148
Colorado	1	120		830,748	68.0	565,031	(1)	(1)	378	237,926	65.7	156,426	(1)	(1)	721,457	(1)
Connecticut	1	61		(2)	(2)	(2)	(2)	(2)							(2)	(2)
Illinois	8	905	45	5,984,119	70.3	4,204,116	26,036,197	6.19							4,204,116	26,036,197
Indiana	7	1,498		8,748,928	73.8	6,455,378	41,208,876	6.38							6,455,378	41,208,876
Kentucky	1	108		(2)	(2)	(2)	(2)	(2)	200						(2)	(2)
Maryland	1	300	61	1,914,048	72.8	1,393,052	(1)	(1)							1,393,052	(1)
Massachusetts	3	381	82	1,126,370	69.0	776,679	5,919,159	7.62							776,679	5,919,159
Michigan	7	576		3,760,441	71.3	2,679,971	14,867,651	5.55							2,679,971	14,867,651
Minnesota	3	196		1,062,179	70.2	746,004	6,478,228	8.68							746,004	6,478,228
Missouri	1	64		(2)	(2)	(2)	(2)	(2)							(2)	(2)
New Jersey	2	207		1,248,662	71.9	897,530	(1)	(1)							897,530	(1)
New York	9	868	37	6,183,918	69.5	4,299,470	25,305,915	5.89							4,299,470	25,305,915
Ohio	15	1,811		12,316,686	69.2	8,521,132	35,202,383	4.13	202	(3)	(3)	(3)	(3)	(3)	[4] 8,521,132	[4] 35,202,383
Oklahoma									100							
Pennsylvania	13	3,420	158	21,643,559	66.9	14,489,283	55,088,803	3.80	22,790	[3] 8,195,528	[3] 65.5	[3] 5,367,685	[3]$17,824,426	[3]$3.32	[3] 19,856,968	[3] 72,913,229
Rhode Island	1	40	25	(2)	(2)	(2)	(2)	(2)							(2)	(2)
Tennessee	1	24		160,842	70.4	113,285	672,913	5.94	723	169,385	56.6	95,881	413,461	4.31	209,166	1,086,374
Utah	1	56		493,945	54.2	267,939	(1)	(1)	819	23,361	60.2	14,055	(1)	(1)	281,994	(1)
Virginia									1,742	527,280	59.7	314,859	1,283,740	4.08	314,859	1,283,740
Washington	1	20		65,845	62.1	40,879	286,153	7.00	190	34,894	74.1	25,844	207,674	8.04	66,723	493,827
West Virginia	4	411		2,056,475	69.6	1,431,314	3,610,883	2.52	2,938	839,142	59.3	497,269	1,675,544	3.37	1,928,583	5,286,427
Wisconsin	2	195		(2)	(2)	(2)	(2)	(2)							(2)	(2)
Combined States				2,453,419	72.4	1,776,796	12,668,372	7.13							1,776,796	12,668,372
Undistributed							16,425,487	5.26					1,159,579	6.80		17,585,066
	90	12,649	408	76,758,958	69.6	53,411,826	256,430,168	4.80	30,082	10,027,516	64.5	6,472,019	22,564,424	3.49	59,883,845	278,994,592

1930																
Alabama	8	1,388	------	5,621,183	70.93	3,986,920	10,741,937	2.69	------	------	------	------	------	------	3,986,920	10,741,937
Colorado	1	151	------	552,639	68.59	379,070	(1)	(1)	378	[5] 122,000	64.98	[6] 79,373	(1)	(1)	458,443	(1)
Connecticut	1	61	------	(2)	(2)	(2)	(2)	(2)	------	------	------	------	------	------	(2)	(2)
Illinois	8	905	45	5,144,535	69.52	3,576,577	21,379,784	5.98	------	------	------	------	------	------	3,576,577	21,379,784
Indiana	6	1,412	138	6,899,911	72.24	4,984,620	12,166,488	2.44	------	------	------	------	------	------	4,984,620	12,166,488
Kentucky	1	108	------	(2)	(2)	(2)	(2)	(2)	------	------	------	------	------	------	(2)	(2)
Maryland	1	360	------	1,628,815	71.77	1,169,016	(1)	(1)	------	------	------	------	------	------	1,169,016	(1)
Massachusetts	3	430	------	1,234,068	69.90	862,663	6,697,235	7.76	------	------	------	------	------	------	862,663	6,697,235
Michigan	7	587	------	3,690,540	70.55	2,603,815	14,222,856	5.46	------	------	------	------	------	------	2,603,815	14,222,856
Minnesota	3	196	------	937,738	68.38	641,205	5,508,979	8.59	------	------	------	------	------	------	641,205	5,508,979
Missouri	1	64	------	(2)	(2)	(2)	(2)	(2)	------	------	------	------	------	------	(2)	(2)
New Jersey	2	202	------	1,276,961	71.95	918,814	(1)	(1)	------	------	------	------	------	------	918,814	(1)
New York	9	956	68	5,566,445	69.16	3,849,563	24,657,090	6.41	------	------	------	------	------	------	3,849,563	24,657,090
Ohio	15	1,811	25	9,102,876	67.71	6,163,324	26,706,788	4.33	202	------	------	------	------	------	6,163,324	26,706,788
Oklahoma	------	------	------	------	------	------	------	------	100	------	------	------	------	------	------	------
Pennsylvania	13	3,478	------	18,776,490	66.73	12,529,255	47,691,068	3.81	17,445	3,018,669	66.63	2,011,324	6,407,168	3.19	14,540,579	54,098,236
Rhode Island	1	65	------	(2)	(2)	(2)	(2)	(2)	------	------	------	------	------	------	(2)	(2)
Tennessee	1	24	------	137,706	72.94	100,439	445,949	4.44	723	47,469	53.66	25,473	77,864	3.06	125,912	523,813
Utah	1	56	------	414,358	54.39	225,361	(1)	(1)	819	11,093	58.66	6,508	(1)	(1)	231,869	(1)
Virginia	------	------	------	------	------	------	------	------	1,642	360,896	60.86	219,656	846,542	3.85	219,656	846,542
Washington	1	20	------	59,837	60.53	36,221	256,807	7.09	80	15,928	76.92	12,252	98,516	8.04	48,473	355,323
West Virginia	4	362	------	2,121,745	69.73	1,479,431	3,587,317	2.42	2,518	708,089	59.56	421,730	1,474,442	3.50	1,901,161	5,061,759
Wisconsin	2	195	------	(2)	(2)	(2)	(2)	(2)	------	------	------	------	------	------	(2)	(2)
Combined States	------	------	------	2,355,474	71.72	1,689,411	11,584,309	6.86	------	------	------	------	------	------	1,689,411	11,584,309
Undistributed	------	------	------	------	------	------	13,977,298	------	------	------	------	------	608,825	------	------	14,586,123
	89	12,831	276	65,521,321	68.98	45,195,705	199,623,905	4.42	23,907	4,284,144	64.80	2,776,316	9,513,357	3.43	47,972,021	209,137,262

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[1] Included under "Undistributed."
[2] Included under "Combined States."
[3] A small amount of beehive coke, produced in Ohio, is included with Pennsylvania.
[4] By-product only; beehive included with Pennsylvania.
[5] Partly estimated.
[6] Quoted from Eighteenth Annual Report of the Colorado State Inspector of Coal Mines, 1930, p. 43.

SCOPE OF REPORT

DEFINITION OF TERMS USED IN STATISTICAL TABLES

The standard unit of measurement in the coke industry in the United States is the short or net ton of 2,000 pounds; unless other notation is made it is the unit employed throughout this chapter.

The term "coke" does not include breeze or fine coke screenings, because operators in general, especially those in the beehive industry, do not regard this fine material as properly so classified. No effort has been made to define accurately the limitation as to size between coke and breeze, and each operator has followed his own regular practice in reporting his output of fine material to the Bureau of Mines. It is probably safe to say, however, that coke breeze and screenings correspond closely in size to the anthracite usually classified as steam sizes; in other words, they include material smaller than pea coal.

ACCOUNTING PRACTICES OF COKE OPERATORS THAT AFFECT STATISTICS

The term "value" as applied to coke in this report means the value at the ovens. For the part of the output that is sold the value is obviously the amount received for the coke f. o. b. ovens, but a considerable proportion of the coke produced in the United States is made in ovens operated by large corporations that not only mine the coal and make the coke but also have blast furnaces and steel mills that consume the entire product of the ovens. Under such conditions fixing a value upon the coke and upon the coal consumed in making it is purely arbitrary. Some corporations charge the coke to the furnace department at cost; others add a percentage of profit or base the reported value on what the coke would cost if purchased.

These differences in accounting practice also affect the relative proportions of the output reported as "sold" and as "used by producer." Between the blast furnaces, which are the largest users of coke, and the coke plants there is a close business relation that at many plants amounts to identity of ownership. Among such affiliated interests the line between sales and interdepartmental transfers is difficult to draw, and a large part of the furnace coke reported as sold actually goes to iron furnaces that are in some way connected with the coke companies. (See Tables 43 and 44, pp. 531 and 535.)

SIX COKE-PRODUCING INDUSTRIES

In the United States coke is produced by a group of six different industries. In addition to that produced in the familiar beehive and by-product ovens, coke is obtained in the manufacture of coal gas, in plants carbonizing coal at low temperatures, in the refining of petroleum, and in the distillation of coal tar. The coke produced, however, differs greatly in character, and the problems affecting each of these industries are separate and distinct.

BEEHIVE AND BY-PRODUCT OVEN COKE

Scope of this report—beehive and by-product coke.—Petroleum coke, low-temperature coke, and gas-house coke are not adapted for blast-furnace and foundry purposes, the uses that consume the great bulk of all coke produced, and the production of coal-tar coke is so limited as to have small importance. Practically, therefore, the coke trade is concerned with beehive and by-product oven coke, and the statistics of this report are confined to these two types except as specifically noted. The dominant position of beehive and by-product coke in the total supply of coke of all kinds is shown by Figure 14. Although their products are interchangeable there are fundamental differences between the beehive and by-product industries which must be kept in mind when the tables in this chapter are examined. The competitive relations between the beehive and by-product industries have been discussed in previous reports of this series and need not be treated here. (See Coke and By-Products in 1924, pp. 666–667.)

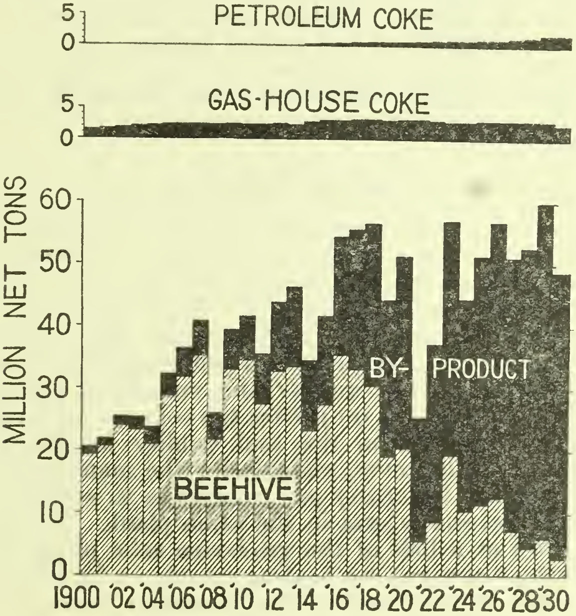

FIGURE 14.—Production of petroleum coke, gas-house coke, and beehive and by-product coke in the United States, 1900–1930. No figures on production of petroleum coke are available before 1914, in which year the production was 213,777 tons

Market conditions continue to foster the development of by-product coking, and the manufacture of beehive coke assumes more and more the character of an auxiliary agency called upon to furnish only the peak requirements of the metallurgical industry in times of active business.

By-product ovens operated by city gas companies included.—Between the by-product coke and the coal-gas industries the line is increasingly difficult to draw. Adaptation of the by-product coke oven to the needs of city-gas manufacture has led a number of gas companies to install batteries of by-product ovens to supplement or even replace their coal or water-gas plants. From the point of view of ownership and accounting these installations are part of the gas utility system, and the Bureau of the Census therefore groups them with the manufactured-gas industry under the title "Gas, manufactured, illuminating and heating."

From other points of view, however, these installations belong to the by-product coke industry. The coke they produce is superior to gas-house coke. In the practical operation of a by-product coke plant the fact that the gas may be distributed through city mains has less consequence than the fact that the coke must be marketed for foundry, furnace, or household use. Considered with reference to oven design and the technique of manufacture and still more with reference to the supply and demand for coke, they should be included with other by-product coke plants, and they are so included in the statistics published by the Bureau of Mines.

These differences in classification are followed advisedly by the Bureau of the Census and the Bureau of Mines after consultation with leaders of the gas and coke industries, and the two offices have collaborated in the collection and analysis of the statistics. To enable the reader to reconcile the two sets of figures and to ascertain the total production of gas and coke from all sources without duplication tables are given on pages 589 to 590 of this report, in which the production of those by-product ovens operated by city gas companies is shown separately.

GAS-HOUSE COKE

Gas-house coke, like beehive and by-product oven coke, is produced by carbonization of coal at high temperatures. For many years coke produced in horizontal retorts has been a factor in the local fuel market of communities supplied with coal gas. Such retort coke is regarded as a by-product, the primary product being the gas. Because of differences in methods of manufacture and because the coals used are commonly selected for the quality and volume of the gas evolved rather than for their coking properties the coke formed is too soft and friable and too irregular in size and quality for blast-furnace or foundry use. It is, however, suitable for the manufacture of water gas, a fact that has led many gas companies to combine water-gas machines and coal-gas retorts in the same plant. For many years, between a third or a half of the gas-house coke produced has been used for making water gas, for heating retorts, or for boiler fuel about the plant where it was made. The remainder was disposed of as domestic fuel in the local market.

Recent years have witnessed an improvement in the quality of gas-house coke in many communities. Greater care has been exercised in screening and sizing the product, and numerous installations of horizontal retorts have been replaced with continuous vertical retorts or with small horizontal gas ovens resembling miniature coke ovens.[2] The total production of gas-house coke in 1927, the latest year for which accurate figures are available, was 2,845,189 tons, of which 1,484,268 tons were sold, presumably for domestic use. (See Table 4.) This total includes not only coke from horizontal retorts but also from all other types of high-temperature carbonizing equipment except coke ovens. Beyond doubt, a considerable proportion of this represents coke from small horizontal ovens.

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[2] McBride, R. S., Miniature Coke Ovens to Serve the Small Community: Am. Gas Jour., July, 1927, pp. 27-31.

TABLE 4.—*Gas-house coke produced and sold in the United States, 1915–1930*

[Figures include coke made in all types of high-temperature carbonizing equipment other than coke ovens]

Year	Production (net tons)	Sales (net tons)	Value of sales	
			Total	Average per net ton
1915 [1]	2,940,926	1,662,552	$7,198,377	$4.33
1917 [1]	3,094,966	1,857,248	10,953,693	5.90
1918 [1]	3,180,535	1,813,740	13,963,232	7.70
1919 [2]	3,035,570	1,485,758	(3)	(3)
1920 [1]	3,137,332	1,378,537	11,638,525	8.44
1921 [2]	3,159,490	1,586,728	(3)	(3)
1922 [1]	2,877,787	1,387,658	12,032,244	8.67
1923 [2]	2,779,993	1,438,463	(3)	(3)
1924	(3)	[4] 1,400,000	(3)	(3)
1925 [2]	2,907,018	1,368,704	(3)	(3)
1926	(3)	[4] 1,400,000	(3)	(3)
1927 [2]	2,845,189	1,484,268	13,642,686	9.19
1928	[4] 2,800,000	[4] 1,450,000	(3)	(3)
1929	(3)	[4] 1,400,000	[4] 15,512,000	[4] 11.08
1930	[4] 2,500,000	[4] 1,300,000	(3)	(3)

[1] Reported by the gas companies direct to the U. S. Geological Survey.

[2] Obtained by subtracting from the total for all manufactured-gas plants (public utilities) as reported by the Census of Manufactures the figures reported to the Bureau of Mines for those by-product coke plants that are counted by the census as a part of the manufactured-gas industry. See Table 104, p. 589, for a recapitulation of the operations of these by-product plants.

[3] No data.

[4] Estimated by interpolation.

LOW-TEMPERATURE COKE

In the United States, as elsewhere, much experimental work has been done in the field of low-temperature carbonization of coal. The solid residue obtained in this process is a semicoke containing some volatile matter. It is unsuitable for metallurgical coke but can be used for the manufacture of easily pulverized, highly combustible material for pulverized-fuel furnaces, or for the production of smokeless domestic fuel. The process of low-temperature carbonization has not yet demonstrated its commercial feasibility in the United States, and the coke derived from this source is negligible.

PETROLEUM COKE

When the refining of crude petroleum is conducted at temperatures above that of decomposition an ultimate residue known as petroleum coke is left. Its physical properties are much like those of coke made from coal, except that it is of finer texture, lacks the strength required for blast-furnace or foundry coke, and is extraordinarily low in ash, probably averaging not more than 1.5 per cent. In 1930 the total production of petroleum coke was 1,940,000 tons. Because of its extremely low ash content petroleum coke is in demand as a source of comparatively pure carbon and is widely used in the manufacture of carbon electrodes, electric-furnace resisters, and dry cells. The rest of the output is disposed of locally, either for miscellaneous purposes or domestic fuel. According to a special study by E. B. Swanson, of the Bureau of Mines, the quantity sold for domestic use in 1928 was 235,000 tons. The total production of petroleum coke in recent years, as reported by G. R. Hopkins, also of the bureau, is shown in Table 5.

TABLE 5.—*Petroleum coke produced and in stock in the United States, 1918–1930, in net tons*

Year	Production	Stock at end of year	Year	Production	Stock at end of year
1918	559, 663	22, 605	1925	990, 991	238, 403
1919	603, 459	21, 146	1926	995, 308	290, 582
1920	576, 613	31, 469	1927	1, 145, 200	345, 100
1921	604, 465	74, 508	1928	1, 426, 000	436, 900
1922	707, 064	35, 722	1929	1, 820, 600	745, 400
1923	672, 526	26, 264	1930	1, 940, 000	1, 069, 100
1924	761, 095	97, 844			

COAL-TAR PITCH COKE

Recent developments have made available another form of coke—that derived from coal-tar pitch. The product, which is known as pitch coke, is not to be confused with the tar-still coke sometimes obtained as the end product of the distillation of tar. Tar-still coke is too soft for metallurgical use and has relatively small value; for this and other reasons it is common practice to run the pitch out of the stills before it reaches the stage of coking. By introducing the pitch into a coke oven, however, and by coking it an excellent metallurgical coke may be produced, which is unusually hard and firm, contains only 0.3 per cent ash, and is very low in sulphur. Pitch coke has proved itself well adapted to foundry use and often commands a premium over coke made from coal. The manufacture of pitch coke is established commercially but has not yet reached the stage where publication of statistics on the subject is expedient.

COKE AND COKE BREEZE

GROWTH OF INDUSTRY

TABLE 6.—*By-product and beehive coke produced in the United States, 1880–1930, in net tons*

Year	By-product	Beehive	Total	Year	By-product	Beehive	Total
1880		3, 338, 300	3, 338, 300	1906	4, 558, 127	31, 843, 090	36, 401, 217
1881		4, 113, 760	4, 113, 760	1907	5, 607, 899	35, 171, 665	40, 779, 564
1882		4, 793, 321	4, 793, 321	1908	4, 201, 226	21, 832, 292	26, 033, 518
1883		5, 464, 721	5, 464, 721	1909	6, 254, 644	33. 060, 421	39, 315, 065
1884		4, 873, 805	4, 873, 805	1910	7, 138, 734	34, 570, 076	41, 708, 810
1885		5, 106, 696	5, 106, 696	1911	7, 847. 845	27, 703, 644	35, 551, 489
1886		6, 845, 369	6, 845, 369	1912	11, 115, 164	32, 868, 435	43, 983, 599
1887		7, 611, 705	7, 611, 705	1913	12, 714, 700	33, 584, 830	46, 299, 530
1888		8, 540. 030	8, 540, 030	1914	11, 219, 943	23, 335, 971	34, 555, 914
1889		10, 258, 022	10, 258, 022	1915	14, 072, 895	27, 508, 255	41, 581, 150
1890		11, 508, 021	11, 508, 021	1916	19, 069, 361	35, 464, 224	54, 533, 585
1891		10, 352, 688	10, 352, 688	1917	22, 439, 280	33, 167, 548	55, 606, 828
1892		12, 010, 829	12, 010, 829	1918	25, 997, 580	30, 480. 792	56, 478, 372
1893	12, 850	9, 464, 730	9, 477. 580	1919	25, 137, 621	19, 042, 936	44, 180, 557
1894	16, 500	9, 187, 132	9, 203, 632	1920	30, 833, 951	20, 511, 092	51, 345, 043
1895	18, 521	13, 315, 193	13, 333, 714	1921	19, 749, 580	5, 538, 042	25, 287, 622
1896	83, 038	11, 705, 735	11, 788, 773	1922	28, 550, 545	8, 573, 467	37, 124, 012
1897	261, 912	13, 027, 072	13, 288, 984	1923	37, 597, 664	19, 379, 870	56, 977, 534
1898	294, 445	15, 752, 764	16, 047, 209	1924	33, 983, 568	10, 286, 037	44, 269, 605
1899	906, 534	18, 762, 035	19, 668, 569	1925	39, 912, 159	11, 354, 784	51, 266, 943
1900	1, 075, 727	19, 457, 621	20, 533, 348	1926	44, 376, 586	12, 488, 951	56, 865, 537
1901	1, 179, 900	20, 615, 983	21, 795, 883	1927	43, 884, 726	7, 207, 417	51, 092, 143
1902	1, 403, 588	23, 998, 142	25, 401. 730	1928	48, 313. 025	4, 492, 803	52, 805, 828
1903	1, 882, 394	23, 391, 887	25, 274, 281	1929	53, 411, 826	6, 472, 019	59, 883, 845
1904	2, 608, 229	21, 052, 877	23, 661, 106	1930	45, 195, 705	2, 776, 316	47, 972, 021
1905	3, 462, 348	28, 768, 781	32, 231, 129				

TABLE 7.—*Statistical summary illustrating growth of the coke industry in the United States, 1880–1930*

Year	Production (million net tons)			Per cent of total production from by-product ovens	Number of ovens in existence		Number of by-product ovens under construction at end of year	Coal charged (million net tons)	Yield of coke from coal (per cent)	Average value of coke per ton at plant	Total value at plant (million dollars)			
	By-product	Beehive	Total		By-product	Beehive					Beehive coke	By-product coke	All by-products[1]	Total coke and by-products
1880	------	3.3	3.3	------	------	12,372	------	5.2	63.7	$1.99	7	------	------	7
1881	------	4.1	4.1	------	------	14,119	------	6.5	62.8	1.88	8	------	------	8
1882	------	4.8	4.8	------	------	16,356	------	7.6	63.3	1.77	8	------	------	8
1883	------	5.5	5.5	------	------	18,304	------	8.5	64.2	1.49	8	------	------	8
1884	------	4.9	4.9	------	------	19,557	------	8.0	61.3	1.49	7	------	------	7
1885	------	5.1	5.1	------	------	20,116	------	8.1	63.3	1.49	8	------	------	8
1886	------	6.8	6.8	------	------	22,597	------	10.7	64.0	1.63	11	------	------	11
1887	------	7.6	7.6	------	------	26,001	------	11.9	64.2	2.01	15	------	------	15
1888	------	8.5	8.5	------	------	30,059	------	12.9	66.0	1.46	12	------	------	12
1889	------	10.3	10.3	------	------	34,165	------	16.0	64.3	1.62	17	------	------	17
1890	------	11.5	11.5	------	------	37,158	------	18.0	63.9	2.02	23	------	------	23
1891	------	10.4	10.4	------	------	40,057	------	16.3	63.3	1.97	20	------	------	20
1892	------	12.0	12.0	------	------	42,002	------	18.8	63.8	1.96	24	------	------	24
1893	0.01	9.5	9.5	0.1	12	44,189	------	14.9	63.5	1.74	17	------	(2)	(2)
1894	.02	9.2	9.2	.2	12	44,760	60	14.4	64.0	1.34	12	------	(2)	(2)
1895	.02	13.3	13.3	.1	72	45,493	60	20.8	64.0	1.44	19		(2)	(2)
1896	.1	11.7	11.8	.7	160	46,784	120	18.7	63.1	1.84	22		(2)	(2)
1897	.3	13.0	13.3	2.0	280	47,388	240	20.9	63.6	1.66	22		(2)	(2)
1898	.3	15.7	16.0	1.8	520	47,863	500	25.2	63.6	1.59	26		(2)	(2)
1899	.9	18.8	19.7	4.6	1,020	48,583	65	30.2	65.1	1.76	35		(2)	(2)
1900	1.1	19.4	20.5	5.2	1,085	57,399	1,096	32.1	63.9	2.31	47		(2)	(2)
1901	1.2	20.6	21.8	5.4	1,165	62,786	1,533	34.2	63.7	2.04	44		------	------
1902	1.4	24.0	25.4	5.5	1,663	67,406	1,346	39.6	64.1	2.49	63		(2)	(2)
1903	1.9	23.4	25.3	7.4	1,956	77,378	1,335	39.4	64.1	2.63	66		(2)	(2)
1904	2.6	21.1	23.7	11.0	2,910	80,689	832	36.5	64.8	1.95	46		(2)	(2)
1905	3.4	28.8	32.2	10.7	3,103	84,405	417	49.5	65.1	2.25	72		(2)	(2)
1906	4.6	31.8	36.4	12.5	3,547	90,354	112	55.7	65.3	2.52	92		(2)	(2)
1907	5.6	35.2	40.8	13.8	3,684	95,996	330	61.9	65.8	2.74	90	22	8	120
1908	4.2	21.8	26.0	16.1	3,799	97,419	240	39.4	66.0	2.40	48	14	7	69
1909	6.2	33.1	39.3	15.9	3,989	99,993	949	59.4	66.2	2.29	70	20	8	98
1910	7.1	34.6	41.7	17.1	4,078	100,362	1,200	63.1	66.1	2.39	75	25	8	108
1911	7.9	27.7	35.6	22.1	4,624	99,255	698	53.3	66.7	2.37	57	27	10	94
1912	11.1	32.9	44.0	25.3	5,211	97,019	793	65.6	67.1	2.54	69	43	14	126
1913	12.7	33.6	46.3	27.5	5,688	96,962	504	69.2	66.9	2.78	80	49	17	146
1914	11.2	23.4	34.6	32.5	5,809	93,946	644	51.6	66.9	2.56	50	38	18	106
1915	14.1	27.5	41.6	33.8	6,268	93,110	1,191	61.8	67.2	2.54	57	49	30	136
1916	19.1	35.4	54.5	35.0	7,283	91,581	2,084	81.6	66.8	3.13	96	75	62	233
1917	22.4	33.2	55.6	40.4	7,869	88,027	2,260	83.8	66.4	5.36	159	139	68	366
1918	26.0	30.5	56.5	46.0	9,279	84,635	1,815	85.0	66.4	6.77	189	193	77	459
1919	25.1	19.1	44.2	56.9	10,379	82,560	877	65.6	67.4	5.85	98	160	68	326
1920	30.8	20.5	51.3	60.0	10,881	75,298	396	76.2	67.4	9.27	163	313	105	581
1921	19.8	5.5	25.3	78.1	11,142	66,014	85	37.2	68.0	5.84	30	118	68	216
1922	28.5	8.6	37.1	76.9	11,212	63,958	403	54.3	68.3	6.42	50	188	95	333
1923	37.6	19.4	57.0	66.0	11,156	62,349	629	84.4	67.5	6.56	116	257	131	504
1924	34.0	10.3	44.3	76.8	11,413	60,432	247	65.0	68.1	5.51	48	196	120	364
1925	39.9	11.4	51.3	77.9	11,290	57,587	429	74.5	68.8	5.12	52	211	143	406
1926	44.4	12.5	56.9	78.0	11,716	52,558	978	82.9	68.6	5.41	57	251	157	465
1927	43.9	7.2	51.1	85.9	12,475	49,795	289	74.4	68.6	5.13	30	232	160	422
1928	48.3	4.5	52.8	91.5	12,544	41,288	145	77.2	68.4	4.79	16	237	177	430
1929	53.4	6.5	59.9	89.2	12,649	30,082	408	86.8	69.0	4.66	23	256	192	471
1930	45.2	2.8	48.0	94.2	12,831	23,907	276	69.8	68.7	4.36	10	200	168	378

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[1] The value for tar up to and including 1917 represented that of the tar "obtained and sold," which did not always include the value of tar used by the producer. Beginning with 1918, tar used by the producer is specifically included. The value of breeze produced at by-product plants is included for those years for which it was reported, namely, 1916, 1917, and 1919–1930. The value of breeze produced at beehive plants is not included, as it has usually been much less than a million dollars.

[2] No accurate data on the value of the by-products available.

MONTHLY AND WEEKLY PRODUCTION

Figures for monthly and weekly production of coke are given in Tables 8 to 11. The monthly statistics of by-product coke are based on reports from the producers themselves.

The current statistics for beehive coke are estimates based on reports of cars of coke loaded for shipment by the principal coke-carrying roads. The reports are now received weekly and are here shown adjusted to a monthly basis. As beehive coke ordinarily is not stored at the ovens in any great quantity the shipments are an excellent indicator of weekly production. The estimates also allow for shipments over the Monongahela River and other waterways and over private railroads and for amounts consumed by associated steelworks close to the ovens.

The estimates thus obtained are published currently in the weekly coal reports of the Bureau of Mines. At the end of the year, if the total of the current estimates does not exactly equal the actual production as reported to the bureau by the operators, an adjustment in the current figures is made. The data in the accompanying tables have been revised in this way.

TABLE 8.—*By-product, beehive, and total coke produced in the United States, 1927–1930, by months, and average per day, in net tons*

Month	1927		1928		1929		1930	
	Total	Daily average	Total	Daily average	Total	Daily average	Total	Daily average
By product:								
January	3, 706, 000	119, 500	3, 906, 000	126, 000	4, 355, 000	140, 500	4, 167, 100	134, 400
February	3, 429, 000	122, 500	3, 731, 000	128, 700	4, 084, 800	145, 900	3, 977, 200	142, 100
March	3, 876, 000	125, 000	4, 074, 000	131, 400	4, 607, 600	148, 600	4, 361, 400	140, 700
April	3, 705, 000	123, 500	3, 934, 000	131, 100	4, 451, 700	148, 400	4, 216, 800	140, 600
May	3, 785, 000	122, 100	4, 109, 000	132, 500	4, 658, 700	150, 300	4, 234, 800	136, 600
June	3, 594, 000	119, 800	3, 970, 000	132, 300	4, 504, 200	150, 200	3, 927, 500	130, 900
July	3, 655, 000	117, 900	3, 920, 000	126, 400	4, 608, 200	148, 700	3, 746, 700	120, 900
August	3, 677, 000	118, 600	4, 004, 000	129, 200	4, 637, 300	149, 600	3, 611, 100	116, 500
September	3, 601, 000	120, 000	3, 967, 000	132, 300	4, 407, 700	146, 900	3, 376, 100	112, 600
October	3, 717, 000	119, 900	4, 229, 000	136, 400	4, 604, 600	148, 500	3, 407, 800	109, 900
November	3, 497, 000	116, 600	4, 142, 000	138, 100	4, 316, 400	143, 900	3, 114, 000	103, 800
December	3, 643, 000	117, 500	4, 327, 000	139, 600	4, 175, 600	134, 700	3, 055. 200	98, 600
	43, 885, 000	120, 200	48, 313, 000	132, 000	53, 411, 800	146, 300	45, 195, 700	123, 900
Beehive:								
January	810, 000	31, 200	385, 000	14, 800	515, 500	19, 100	318, 000	11, 800
February	776, 000	32, 300	400, 000	16, 000	473, 700	19, 700	279, 000	11, 600
March	916, 000	33, 900	459, 000	17, 100	574, 000	22, 100	288, 700	11, 100
April	802, 000	30, 800	387, 000	15, 500	503, 200	19, 300	299, 600	11, 500
May	648, 000	24, 900	386, 000	14, 300	642, 800	23, 800	270, 100	10, 000
June	596, 000	22, 900	311, 000	11, 900	648, 200	25, 900	259, 800	10, 400
July	480, 000	19, 200	280, 000	11, 200	645, 800	24, 800	213, 100	8, 200
August	500, 000	18, 500	297, 000	10, 900	604, 500	22, 400	168, 300	6, 500
September	470, 000	18, 100	322, 000	12, 800	542, 600	21, 700	166, 900	6, 400
October	431, 000	16, 600	431, 000	16, 000	505, 900	18, 800	176, 600	6, 600
November	390, 000	15, 000	427, 000	16, 400	444, 700	17, 100	166, 300	6, 700
December	388, 000	14, 900	408, 000	16, 300	371, 100	14, 800	169. 900	6, 500
	7, 207, 000	23, 200	4, 493, 000	14, 400	6, 472, 000	20, 800	2, 776, 300	8, 900
Total coke:								
January	4, 516, 000	150, 700	4, 291, 000	140, 800	4, 870, 500	159, 600	4, 485, 100	146, 200
February	4, 205, 000	154. 800	4, 131, 000	144, 700	4, 558, 500	165, 600	4, 256, 200	153, 700
March	4, 792, 000	158, 900	4, 533, 000	148. 500	5, 181, 600	170, 700	4, 650, 100	151, 800
April	4, 507, 000	154, 300	4, 321, 000	146, 600	4, 954, 900	167, 700	4, 516, 400	152, 100
May	4, 433, 000	147, 000	4, 495, 000	146, 800	5, 301, 500	174, 100	4, 504, 900	146, 600
June	4, 190, 000	142, 700	4, 281, 000	144, 200	5, 152, 400	176, 100	4, 187, 300	141, 300
July	4, 135, 000	137, 100	4, 200, 000	137. 600	5, 254, 000	173, 500	3, 959, 800	129, 100
August	4, 177, 000	137, 100	4, 301, 000	140, 100	5, 241, 800	172. 000	3, 779, 400	123, 000
September	4, 071, 000	138, 100	4, 289, 000	145, 100	4, 950, 300	168, 600	3, 543, 000	119, 000
October	4, 148, 000	136, 500	4, 660, 000	152, 400	5, 110, 500	167, 300	3, 584, 400	116, 500
November	3, 887, 000	131, 600	4, 569, 000	154, 500	4, 761, 100	161, 000	3, 280, 300	110, 500
December	4, 031, 000	132, 400	4, 735, 000	155, 900	4, 546, 700	149, 500	3, 225, 100	105, 100
	51, 092, 000	143, 400	52, 806, 000	146, 400	59, 883, 800	167, 100	47, 972, 000	132, 800

TABLE 9.—*Coke shipped from the Connellsville and Lower Connellsville districts, Pennsylvania, 1923–1930, by months, in net tons* [1]

Month	1923	1924	1925	1926	1927	1928	1929	1930
January	1, 046, 630	937, 790	904, 110	1, 004, 330	570, 720	221, 200	292, 842	124, 552
February	1, 048, 425	921, 070	795, 690	934, 060	552, 150	222, 550	270, 314	132, 627
March	1, 292, 435	1, 024, 770	785, 080	856, 600	630, 990	299, 400	338, 624	130, 354
April	1, 270, 355	800, 420	583, 740	756, 170	579, 330	261, 000	324, 140	137, 546
May	1, 342, 545	504, 740	349, 400	672, 550	468, 340	218, 060	457, 792	130, 987
June	1, 306, 750	303, 370	325, 800	602, 690	401, 310	185, 570	440, 028	127, 252
July	1, 196, 660	243, 090	265, 780	555, 440	302, 280	130, 380	450, 395	95, 807
August	1, 144, 790	205, 430	414, 510	545, 850	306, 000	137, 560	419, 595	82, 847
September	1, 005, 200	263, 520	513, 590	603, 680	273, 290	145, 660	337, 974	78, 431
October	914, 800	329, 430	673, 920	642, 310	222, 280	260, 470	281, 206	80, 304
November	781, 690	451, 950	830, 460	609, 010	187, 320	269, 010	207, 520	67, 061
December	754, 060	668, 980	953, 040	559, 640	187, 690	254, 090	160, 330	70, 082
	13, 104, 340	6, 654, 560	7, 395, 120	8, 342, 330	4, 681, 700	2, 604, 950	3, 980, 760	1, 257, 850

[1] From the Connellsville Courier. For 1929 and 1930 the weekly shipments as reported by the Courier have been prorated on a monthly basis by the Bureau of Mines.

TABLE 10.—*Beehive coke produced in the United States in 1930, by weeks*

[Estimated from railroad shipments]

Week ended—	Net tons	Week ended—	Net tons	Week ended—	Net tons
Jan. 1-4 [1]	51, 900	May 17	59, 800	Sept. 27	41, 500
Jan. 11	72, 600	May 24	57, 000	Oct. 4	38, 500
Jan. 18	71, 100	May 31	61, 000	Oct. 11	35, 700
Jan. 25	69, 500	June 7	61, 900	Oct. 18	37, 700
Feb. 1	63, 500	June 14	61, 800	Oct. 25	43, 000
Feb. 8	74, 600	June 21	67, 300	Nov. 1	41, 400
Feb. 15	66, 300	June 28	59, 200	Nov. 8	42, 000
Feb. 22	70, 500	July 5	45, 800	Nov. 15	39, 500
Mar. 1	68, 400	July 12	51, 300	Nov. 22	37, 700
Mar. 8	64, 300	July 19	49, 500	Nov. 29	40, 200
Mar. 15	65, 300	July 26	45, 000	Dec. 6	43, 600
Mar. 22	68, 400	Aug. 2	44, 000	Dec. 13	40, 000
Mar. 29	66, 700	Aug. 9	40, 300	Dec. 20	39, 100
Apr. 5	75, 800	Aug. 16	40, 800	Dec. 27	31, 400
Apr. 12	70, 100	Aug. 23	36, 600	Dec. 29-31 [2]	17, 800
Apr. 19	67, 300	Aug. 30	36, 000		
Apr. 26	67, 400	Sept. 6	36, 400		2, 776, 300
May 3	62, 600	Sept. 13	37, 800		
May 10	61, 000	Sept. 20	38, 400		

[1] 4 days only.

[2] 3 days only.

TABLE 11.—*By-product coke produced in the United States in 1930, by months and by States, in net tons* [1]

State	January	February	March	April	May	June	July
Alabama	401, 100	355, 600	385, 500	373, 600	383, 700	350, 100	325, 300
Colorado	45, 900	40, 200	43, 000	41, 400	38, 400	29, 400	27, 500
Illinois	314, 400	307, 900	338, 700	320, 800	326, 200	310, 100	299, 400
Indiana	442, 600	493, 000	505, 400	486, 500	520, 400	461, 100	379, 000
Maryland	112, 600	114, 600	125, 400	117, 300	106, 200	94, 300	92, 400
Massachusetts	66, 300	60, 800	68, 900	65, 300	66, 300	65, 400	71, 000
Michigan	227, 000	204, 700	227, 000	219, 800	228, 400	224, 200	228, 400
Minnesota	55, 700	49, 200	55, 300	52, 100	54, 900	53, 900	53, 500
New Jersey	77, 000	70, 700	77, 300	73, 900	77, 600	75, 700	77, 400
New York	362, 900	328, 400	363, 000	360, 300	365, 100	341, 800	314, 100
Ohio	559, 600	555, 300	660, 300	625, 000	592, 900	530, 700	511, 900
Pennsylvania	1, 189, 000	1, 111, 300	1, 197, 000	1, 176, 500	1, 161, 500	1, 100, 100	1, 080, 800
Tennessee	10, 200	9, 700	10, 700	9, 300	8, 800	7, 400	7, 200
Utah	23, 000	22, 200	20, 800	20, 200	18, 900	18, 300	18, 900
Washington	3, 600	3, 100	3, 400	3, 100	3, 100	3, 100	2, 900
West Virginia	113, 300	101, 000	118, 100	122, 100	129, 000	122, 500	124, 600
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	162, 900	149, 500	161, 600	149, 600	153, 400	139, 400	132, 400
	4, 167, 100	3, 977, 200	4, 361, 400	4, 216, 800	4, 234, 800	3, 927, 500	3, 746, 700

State	August	September	October	November	December	Total
Alabama	317, 800	285, 500	269, 300	263, 500	275, 900	3, 986, 900
Colorado	15, 200	14, 800	19, 500	27, 200	36, 600	379, 100
Illinois	291, 500	267, 200	274, 700	260, 400	265, 300	3, 576, 600
Indiana	360, 400	330, 800	342, 400	334, 000	329, 000	4, 984, 600
Maryland	93, 300	91, 600	90, 000	72, 300	59, 000	1, 169, 000
Massachusetts	75, 800	68, 100	64, 800	89, 900	100, 100	862, 700
Michigan	215, 300	203, 600	221, 100	208, 200	196, 100	2, 603, 800
Minnesota	52, 900	52, 900	57, 000	51, 300	52, 500	641, 200
New Jersey	77, 800	75, 500	79, 100	77, 100	79, 700	918, 800
New York	301, 000	269, 900	280, 600	282, 200	280, 300	3, 849, 600
Ohio	481, 400	446, 200	454, 200	383, 400	362, 400	6, 163, 300
Pennsylvania	1, 029, 900	982, 300	962, 300	800, 600	738, 000	12, 529, 300
Tennessee	7, 200	6, 900	7, 200	7, 500	8, 300	100, 400
Utah	18, 900	16, 500	16, 000	16, 000	15, 700	225, 400
Washington	3, 000	2, 600	2, 600	2, 600	3, 100	36, 200
West Virginia	136, 600	137, 400	141, 400	115, 800	117, 600	1, 479, 400
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	133, 100	124, 300	125, 600	122, 000	135, 600	1, 689, 400
	3, 611, 100	3, 376, 100	3, 407, 800	3, 114, 000	3, 055, 200	45, 195, 700

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[1] Based upon reports from all producers.

PRODUCTION BY FURNACE AND NONFURNACE PLANTS

Tables 12 to 14 give the production of by-product coke by plants associated with iron furnaces and by other plants.

The terms "furnace" and "merchant" operators originated in the Connellsville beehive-coke trade. As the name implies, the beehive-furnace interests are those affiliated with the producers of iron and steel whose output does not ordinarily enter the open market. In the by-product industry, however, it is not always easy to classify a particular plant. There are by-product plants financially affiliated with iron furnaces, in which the bulk of the product is nevertheless foundry and domestic coke which must be sold on the competitive market. There have been other plants—entirely independent of iron furnaces in point of ownership—that nevertheless were operated under contract to produce furnace coke exclusively for an adjacent ironworks.

A "furnace" plant is now defined as one that has for its main business the production of furnace coke and that has an assured outlet for its furnace coke either through financial affiliation with/or direct ownership by an ironworks, or through long-time contracts. Under this definition the class of "other" plants includes a few plants affiliated with local iron furnaces but producing much more coke than the furnaces can absorb and therefore depending chiefly on the foundry and domestic trade or on merchant sales of furnace coke. It also includes merchant producers of furnace coke who have to sell their output on the competitive market; it includes the plants affiliated with alkali works; it includes all those operated as gas utilities; and it includes the growing number of plants that, although not public utilities, have been constructed primarily to supply city gas and that must sell their coke where they can for domestic and industrial as well as metallurgical use. Because of the miscellaneous character of this group of plants it is thought best to designate them not as "merchant" but as "nonfurnace" or "other" plants.

The classification assigned each plant in the country is indicated in Table 23 under the column "Type of plant." From time to time it may be necessary to change the classification of a given plant because of a change in ownership or market connections.

The comparative decrease in output of furnace and nonfurnace plants in 1930 throws an interesting light on the market outlet for the two types of furnaces. The substantial decline in furnace coke output, 19.5 per cent from the 1929 level, reflects the decline in pig-iron output, while the much smaller decline by nonfurnace plants is an indicator of the greater stability of the diversified nonmetallurgical coke market.

TABLE 12.—*Number and production of by-product coke plants connected with iron furnaces and of other by-product plants, 1913–1930*

Year	Number of active plants		Coke produced (net tons)		Percentage of production	
	Furnace plants	Other plants	Furnace plants	Other plants	Furnace plants	Other plants
1913	20	16	9, 277, 832	3, 436, 868	73. 0	27. 0
1914	22	15	7, 832, 950	3, 386, 993	69. 8	30. 2
1915	23	17	10, 206, 434	3, 866, 461	72. 5	27. 5
1916	28	18	14, 006, 214	5, 063, 147	73. 4	26. 6
1917	31	21	16, 607, 870	5, 831, 410	74. 0	26. 0
1918	36	24	19, 220, 342	6, 777, 238	73. 9	26. 1
1919	40	25	19, 135, 587	6, 002, 034	76. 1	23. 9
1920	42	26	24, 257, 128	6, 576, 823	78. 7	21. 3
1921	42	25	15, 878, 899	3, 870, 681	80. 4	19. 6
1922	39	25	22, 850, 186	5, 700, 359	80. 0	20. 0
1923	40	25	29, 660, 369	7, 937, 295	78. 9	21. 1
1924	42	29	26, 919, 283	7, 064, 285	79. 2	20. 8
1925	43	31	31, 494, 030	8, 418, 129	78. 9	21. 1
1926	43	35	34, 714, 462	9, 662, 124	78. 2	21. 8
1927	44	35	34, 110, 858	9, 773, 868	77. 7	22. 3
1928	46	39	38, 244, 254	10, 068, 771	79. 2	20. 8
1929	46	41	41, 224, 387	12, 187, 439	77. 2	22. 8
1930	46	43	33, 206, 054	11, 989, 65	73. 5	26. 5

TABLE 13.—*Monthly and average daily production of by-product coke by plants associated with iron furnaces and by all other plants, 1928–1930, in net tons*

	1928		1929		1930	
	Furnace plants	Other plants	Furnace plants	Other plants	Furnace plants	Other plants
Monthly production:						
January	3, 048, 000	858, 000	3, 375, 600	979, 400	3, 102, 500	1, 064, 600
February	2, 945, 000	786, 000	3, 156, 800	928, 000	3, 008, 200	969, 000
March	3, 236, 000	838, 000	3, 586, 900	1, 020, 700	3, 317, 000	1, 044, 400
April	3, 129, 000	805, 000	3, 458, 600	993, 100	3, 205, 900	1, 010, 900
May	3, 289, 000	820, 000	3, 630, 100	1, 028, 600	3, 197, 500	1, 037, 300
June	3, 157, 000	813, 000	3, 497, 400	1, 006, 800	2, 955, 500	972, 000
July	3, 122, 000	798, 000	3, 592, 900	1, 015, 300	2, 759, 000	987, 700
August	3, 199, 000	805, 000	3, 602, 000	1, 035, 300	2, 620, 300	990, 800
September	3, 133, 000	834, 000	3, 386, 700	1, 021, 000	2, 432, 400	943, 700
October	3, 346, 000	883, 000	3, 536, 500	1, 068, 100	2, 439, 900	967, 900
November	3, 257, 000	885, 000	3, 293, 100	1, 023, 300	2, 136, 500	977, 500
December	3, 383, 000	944, 000	3, 107, 800	1, 067, 800	2, 031, 400	1, 023, 800
	38, 244, 000	10, 069, 000	41, 224, 400	12, 187, 400	33, 206, 100	11, 989, 600
Average daily production:						
January	98, 300	27, 700	108, 900	31, 600	100, 100	34, 300
February	101, 600	27, 100	112, 800	33, 100	107, 400	34, 600
March	104, 400	27, 000	115, 700	32, 900	107, 000	33, 700
April	104, 300	26, 800	115, 300	33, 100	106, 900	33, 700
May	106, 100	26, 400	117, 100	33, 200	103, 100	33, 500
June	105, 200	27, 100	116, 600	33, 500	98, 500	32, 400
July	100, 700	25, 700	115, 900	32, 800	89, 000	31, 900
August	103, 200	26, 000	116, 200	33, 400	84, 500	32, 000
September	104, 500	27, 800	112, 900	34, 000	81, 100	31, 500
October	107, 900	28, 500	114, 100	34, 400	78, 700	31, 200
November	108, 600	29, 500	109, 800	34, 100	71, 200	32, 600
December	109, 100	30, 500	100, 300	34, 400	65, 500	33, 000
Average	104, 500	27, 500	112, 900	33, 400	91, 000	32, 800

TABLE 14.—*Percentage of total monthly output of by-product coke produced by plants associated with iron furnaces and by other plants, 1928–1930*

Month	1928		1929		1930	
	Furnace plants	Other plants	Furnace plants	Other plants	Furnace plants	Other plants
January	78.0	22.0	77.5	22.5	74.4	25.6
February	78.9	21.1	77.3	22.7	75.6	24.4
March	79.4	20.6	77.8	22.2	76.1	23.9
April	79.5	20.5	77.7	22.3	76.0	24.0
May	80.0	20.0	77.9	22.1	75.5	24.5
June	79.5	20.5	77.6	22.4	75.3	24.7
July	79.6	20.4	78.0	22.0	73.6	26.4
August	79.9	20.1	77.7	22.3	72.6	27.4
September	79.0	21.0	76.8	23.2	72.0	28.0
October	79.1	20.9	76.8	23.2	71.6	28.4
November	78.6	21.4	76.3	23.7	68.6	31.4
December	78.2	21.8	74.4	25.6	66.5	33.5
Average	79.2	20.8	77.2	22.8	73.5	26.5

PRODUCTION BY STATES AND DISTRICTS

TABLE 15.—*Rank of States in the production of coke in 1930 and highest recorded production*

State	Rank in 1930	Net tons, 1930	Maximum production		State	Rank in 1930	Net tons, 1930	Maximum production	
			Year	Net tons				Year	Net tons
Pennsylvania	1	14, 540, 579	1916	31, 279, 695	Kentucky	16	(2)	1917	863, 071
Ohio	2	6, 163, 324	1929	[1] 8, 521, 132	Utah	17	231, 869	1925	314, 159
Indiana	3	4, 984, 620	1929	6, 455, 378	Missouri	18	(2)	1923	(2)
Alabama	4	3, 986, 920	1917	4, 892, 589	Virginia	19	219, 656	1906	1, 577, 659
New York	5	3, 849, 563	1929	4, 299, 470	Rhode Island	20	(2)	1930	(2)
Illinois	6	3, 576, 577	1929	4, 204, 116	Tennessee	21	125, 912	1902	560, 006
Michigan	7	2, 603, 815	1929	2, 679, 971	Washington	22	48, 473	1915	136, 552
West Virginia	8	1, 901, 161	1907	4, 112, 896	Georgia [3]	----	----	1891	103, 057
Maryland	9	1, 169, 016	1929	1, 393, 052	New Mexico [3]	----	----	1918	597, 072
New Jersey	10	918, 814	1930	918, 814	Oklahoma [3]	----	----	[4] 1905	[4] 54, 781
Massachusetts	11	862, 663	1930	862, 663	Kansas [3]	----	----	[4] 1902	[4] 20, 902
Minnesota	12	641, 205	1918	784, 065	Montana [3]	----	----	[4] 1897	[4] 67, 849
Wisconsin	13	(2)	1918	(2)	Wyoming [3]	----	----	[4] 1897	[4] 24, 007
Colorado	14	458, 443	1906	1, 455, 905	Texas [3]	----	----	[4] 1897	[4] 394
Connecticut	15	(2)	1930	(2)					

[1] By-product coke only. Beehive coke can not be shown without disclosing individual operations.
[2] Can not be shown without disclosing individual operations.
[3] Seven States which formerly produced coke have dropped out of the list of producers. Georgia last produced in 1928, New Mexico in 1926, Oklahoma in 1910, Kansas in 1912, Montana in 1911, Wyoming in 1906, Texas in 1897.
[4] Figures represent maximum year that can be published without disclosing individual operations.

TABLE 16.—*By-product and beehive coke produced, by States, 1918 and 1927–1930, in net tons*

State	1918	1927	1928	1929	1930
By-product:					
Alabama	2, 634, 451	4, 364, 354	4, 327, 324	4, 753, 967	3, 986, 920
Colorado	230, 663	594, 402	605, 822	565, 031	379, 070
Connecticut	----	----	(1)	(1)	(1)
Illinois	2, 285, 610	3, 013, 940	3, 240, 964	4, 204, 116	3, 576, 577
Indiana	3, 898, 215	5, 549, 762	6, 094, 201	6, 455, 378	4, 984, 620
Kentucky	517, 749	(1)	(1)	(1)	(1)
Maryland	474, 368	1, 077, 309	1, 186, 398	1, 393, 052	1, 169, 016
Massachusetts	556, 397	744, 091	687, 356	776, 679	862, 663
Michigan	(1)	1, 920, 394	2, 399, 656	2, 679, 971	2, 603, 815
Minnesota	784, 065	632, 628	622, 696	746, 004	641, 205
Missouri	(1)	(1)	(1)	(1)	(1)
New Jersey	682, 148	906, 321	903, 177	897, 530	918, 814
New York	1, 069, 587	3, 602, 642	3, 802, 657	4, 299, 470	3, 849, 563
Ohio	5, 226, 334	7, 213, 619	7, 786, 199	8, 521, 132	6, 163, 324
Pennsylvania	4, 586, 981	11, 061, 084	13, 475, 349	14, 489, 283	12, 529, 255
Rhode Island	----	(1)	(1)	(1)	(1)
Tennessee	124, 469	122, 312	113, 134	113, 285	100, 439
Utah	----	197, 183	246, 503	267, 939	225, 361
Washington	30, 129	40, 570	40, 755	40, 879	36, 221
West Virginia	603, 393	1, 396, 285	1, 367, 481	1, 431, 314	1, 479, 431
Wisconsin	(1)	(1)	(1)	(1)	(1)
Combined States	2, 293, 021	1, 447, 830	1, 413, 353	1, 776, 796	1, 689, 411
	25, 997, 580	43, 884, 726	48, 313, 025	53, 411, 826	45, 195, 705
Beehive:					
Alabama	1, 717, 721	----	----	----	----
Colorado	758, 784	194, 184	144, 200	156, 426	79, 373
Georgia	22, 048	(1)	(1)	----	----
Kentucky	301, 036	(1)	(1)	----	----
New Mexico	597, 072	----	----	----	----
Ohio	138, 909	(1)	(1)	(2)	----
Oklahoma	(1)	----	----	----	----
Pennsylvania	22, 136, 664	5, 716, 207	3, 442, 006	[2] 5, 367, 685	2, 011, 324
Tennessee	302, 637	104, 808	103, 791	95, 881	25, 473
Utah	(1)	84, 865	28, 097	14, 055	6, 508
Virginia	1, 234, 256	316, 754	247, 734	314, 859	219, 656
Washington	93, 659	30, 701	18, 747	25, 844	12, 252
West Virginia	2, 716, 613	527, 142	431, 419	497, 269	421, 730
Combined States	461, 393	232, 756	76, 809	----	----
	30, 480, 792	7, 207, 417	4, 492, 803	6, 472, 019	2, 776, 316
Grand total	56, 478, 372	51, 092, 143	52, 805, 828	59, 883, 845	47, 972, 021

[1] Included under "Combined States."
[2] A small amount of beehive coke produced in Ohio is included with Pennsylvania.

TABLE 17.—*By-product and beehive coke produced in Pennsylvania, 1929 and 1930 by districts*

[The figures of number of plants and ovens include those that were idle during the year]

District	Plants	Ovens		Coal used (net tons)	Yield of coke from coal (per cent)	Coke produced (net tons)	Value of coke at ovens	
		Built	Under construction				Total	Per ton
1929								
By-product:								
Eastern Pennsylvania [1]	6	864	-------	3,548,817	70.8	2,513,725	$12,803,069	$5.09
Western Pennsylvania [2]	7	2,556	158	18,094,742	66.2	11,975,558	42,285,734	3.53
	13	3,420	158	21,643,559	66.9	14,489,283	55,088,803	3.80
Beehive:								
Allegheny Mountain and Allegheny Valley	4	524	-------	201,726	58.2	117,477	505,225	4.30
Connellsville	46	10,056	-------	2,241,830	63.7	1,428,227	5,115,645	3.58
Lower Connellsville	32	7,882	-------	3,985,720	68.0	2,710,221	7,787,124	2.87
Upper Connellsville	9	1,322	-------	426,798	62.3	265,808	1,021,391	3.84
Pittsburgh and other districts [3]	11	3,006	-------	[4] 1,339,454	[4] 63.2	[4] 845,952	[4] 3,395,041	[4] 4.01
	102	22,790	-------	[4] 8,195,528	[4] 65.5	[4] 5,367,685	[4] 17,824,426	[4] 3.32
Grand total	115	26,210	158	[4] 29,839,087	[4] 66.5	[4] 19,856,968	[4] 72,913,229	[4] 3.67
1930								
By-product:								
Eastern Pennsylvania [1]	6	864	-------	3,309,004	70.34	2,327,490	12,698,079	5.46
Western Pennsylvania [2]	7	2,614	-------	15,467,486	65.96	10,201,765	34,992,989	3.43
	13	3,478	-------	18,776,490	66.73	12,529,255	47,691,068	3.81
Beehive:								
Allegheny Mountain and Allegheny Valley	4	524	-------	138,931	60.43	83,961	383,071	4.56
Connellsville	36	7,393	-------	409,842	66.34	271,893	871,654	3.21
Lower Connellsville	27	6,236	-------	1,673,712	68.43	1,145,368	3,235,996	2.83
Upper Connellsville	8	1,114	-------	327,929	65.01	213,183	773,421	3.63
Pittsburgh and other districts [3]	10	2,178	-------	468,255	63.41	296,919	1,143,026	3.85
	85	17,445	-------	3,018,669	66.63	2,011,324	6,407,168	3.19
Grand total	98	20,923	-------	21,795,159	66.71	14,540,579	54,098,236	3.72

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[1] Includes plants at Bethlehem, Chester, Lebanon, Philadelphia, Steelton, and Swedeland.

[2] Includes plants at Aliquippa, Clairton, Erie, Johnstown, Midland, Neville Island, and Pittsburgh.

[3] Includes in 1929, Bedford, Clearfield, Huntingdon, Jefferson, and parts of Indiana and Westmoreland Counties; in 1930, Bedford, Huntingdon, and parts of Indiana and Westmoreland Counties.

[4] A small amount of coke produced in Ohio is included with Pennsylvania.

TABLE 18.—*By-product and beehive coke produced in Ohio, 1929 and 1930, by districts*

District	Plants	Ovens		Coal used (net tons)	Yield of coke from coal (per cent)	Coke produced (net tons)	Value of coke at ovens	
		Built	Under construction				Total	Per ton
1929								
By-product:								
Canton, Cleveland, and Massillon	5	595	-------	3,963,934	70.5	2,794,431	$10,900,017	$3.90
Youngstown	3	594	-------	3,808,797	65.4	2,491,956	10,050,899	4.03
Other districts [1]	7	622	-------	4,543,955	71.2	3,234,745	14,251,467	4.41
	15	1,811	-------	12,316,686	69.2	8,521,132	35,202,383	4.13
Beehive	1	202	-------	(2)	(2)	(2)	(2)	(2)
Grand total	16	2,013	-------	(2)	(2)	(2)	(2)	(2)
1930								
By-product:								
Canton, Cleveland, and Massillon	5	595	-------	2,633,297	68.83	1,812,437	8,068,967	4.45
Youngstown	3	594	-------	2,814,950	62.59	1,761,997	6,997,270	3.97
Other districts [1]	7	622	25	3,654,629	70.84	2,588,890	11,640,551	4.50
	15	1,811	25	9,102,876	67.71	6,163,324	26,706,788	4.33
Beehive	1	202	-------	------------	-------	------------	------------	------
Grand total	16	2,013	25	9,102,876	67.71	6,163,324	26,706,788	4.33

[1] Includes plants at Hamilton, Ironton, Lorain, Painesville, Portsmouth, Toledo, and Warren.
[2] Not at liberty to publish. Figures for beehive coke included with Pennsylvania.

TABLE 19.—*By-product and beehive coke produced in West Virginia, 1929 and 1930, by districts*

[The figures of number of plants and ovens include those that were idle during the year]

District	Plants	Ovens in existence [1]	Coal used (net tons)	Yield of coke from coal (per cent)	Coke produced	Value of coke at ovens	
						Total	Per ton
1929							
By-product: Fairmont, Benwood, Follansbee, and Weirton	4	[2] 411	2,056,475	69.6	1,431,314	$3,610,883	$2.52
Beehive:							
Flat Top	4	795	28,813	62.5	18,008	64,820	3.60
Kanawha, Upper Monongahela, and Panhandle	10	1,324	599,170	59.8	358,006	1,104,822	3.09
New River	6	659	209,033	57.4	119,989	500,256	4.17
Upper Potomac and Tygarts Valley	3	160	2,126	59.5	1,266	5,646	4.46
	23	2,938	839,142	59.3	497,269	1,675,544	3.37
Grand total	27	3,349	2,895,617	66.6	1,928,583	5,286,427	2.74
1930							
By-product: Fairmont, Belle, East Steubenville, and Weirton	4	[3] 362	2,121,745	69.73	1,479,431	3,587,317	2.42
Beehive:							
Flat Top	4	795	123,058	56.96	70,095	288,815	4.12
Kanawha, Upper Monongahela, and Panhandle	7	1,107	472,293	60.63	286,370	897,816	3.14
New River	5	516	112,738	57.89	65,265	287,811	4.41
Upper Potomac and Tygarts Valley	2	100	------------	-------	------------	------------	------
	18	2,518	708,089	59.56	421,730	1,474,442	3.50
Grand total	22	2,880	2,829,834	67.18	1,901,161	5,061,759	2.66

[1] No ovens under construction at end of year.
[2] Includes 291 Koppers and 120 Semet-Solvay ovens.
[3] Includes 316 Koppers and 46 Wilputte ovens.

NUMBER AND TYPE OF OVENS

During 1930 the net increase in annual coke-oven capacity at by-product plants contracted for or placed in operation was equal to 2,900,000 tons. (See Table 22, p. 508.) An analysis of the new plants, according to Ramsburg,[3] shows that approximately one-third were built for gas companies or for merchant plants from which the gas is or is to be distributed to local gas companies. Two-thirds of the capacity installed was for companies directly engaged in the production of iron and steel. The battery of ovens erected at Weirton, W. Va., was built so that blast-furnace gas heating could be used. A blast-furnace gas-cleaning plant was installed in order that the high-B. t. u. coke-oven gas could be secured for use in specialized heat-treating processes while the low-B. t. u. blast-furnace gas was used in a highly efficient manner in connection with the oven heating. The advantages possible by this interchange of gases are becoming more and more appreciated. More than one-third of the total new tonnage being built in the country will be underfired with blast-furnace gas or with producer gas made from small coke and coke breeze.

Tables 20 to 26 show the number and location of different types of coke ovens. Table 23 gives a complete list of by-product plants by name and Table 26 gives similar data for beehive coke plants.

Because of the gradual replacement of beehive with by-product coke large numbers of beehive ovens in the country have produced no coke for years and are falling into disrepair. It has been the practice of the Bureau of Mines to retain such batteries of ovens on its lists until notified by the operator that they were definitely abandoned. With the passage of time it became clear that many of the ovens listed could not be used again without very extensive repairs, and in 1929 the following inquiry was made to the owners of plants that had produced no coke for five years or more: "Please state whether in your opinion this plant will ever be operated again as it stands, or with minor repairs." The replies indicated that a considerable number of plants hitherto carried on the lists as idle could be considered as abandoned. As a result, the number of beehive ovens counted as "Abandoned" during the year was unusually high—11,611, as against 8,299 in 1928. The number abandoned in 1930 fell to 6,503.

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[3] Ramsburg, C. J., Coke Ovens in the Steel Industry. Developments During the Year 1930: Blast Furnace and Steel Plant, vol. 19, No. 1, January, 1931, p. 108.

TABLE 20.—*By-product coke ovens in existence and under construction at end of each year, by States, 1927–1930*

State	1927		1928		1929		1930	
	In existence	Under construction	In existence	Under construction	In existence	Under construction	In existence	Under construction
Alabama	1,325	63	1,388	--------	1,388	--------	1,388	--------
Colorado	120	--------	120	--------	120	--------	151	--------
Connecticut	--------	61	61	--------	61	--------	61	--------
Illinois	849	101	937	21	905	45	905	45
Indiana	1,384	--------	1,384	--------	1,498	--------	1,412	138
Kentucky	108	--------	108	--------	108	--------	108	--------
Maryland	360	--------	360	--------	300	61	360	--------
Massachusetts	481	--------	381	--------	381	82	430	--------
Michigan	561	--------	576	--------	576	--------	587	--------
Minnesota	215	41	196	--------	196	--------	196	--------
Missouri	64	--------	64	--------	64	--------	64	--------
New Jersey	207	--------	207	--------	207	--------	202	--------
New York	778	--------	868	--------	868	37	956	68
Ohio	1,778	--------	1,820	15	1,811	--------	1,811	25
Pennsylvania	3,429	--------	3,235	109	3,420	158	3,478	--------
Rhode Island	40	--------	40	--------	40	25	65	--------
Tennessee	24	--------	24	--------	24	--------	24	--------
Utah	33	23	56	--------	56	--------	56	--------
Washington	20	--------	20	--------	20	--------	20	--------
West Virginia	411	--------	411	--------	411	--------	362	--------
Wisconsin	288	--------	288	--------	195	--------	195	--------
	12,475	289	12,544	145	12,649	408	12,831	276
At merchant plants	3,170	92	3,256	95	3,408	144	3,429	93
At furnace plants	9,305	197	9,288	50	9,241	264	9,402	183

TABLE 21.—*Beehive coke ovens in existence at end of each year, by States, 1925–1930*

State	1925	1926	1927	1928	1929 [1]	1930
Alabama	4,961	1,831	1,831	953	----------	----------
Colorado	1,681	1,527	1,498	1,498	378	378
Georgia	151	151	151	----------	----------	----------
Kentucky	795	763	763	608	200	----------
New Mexico	1,030	584	584	584	----------	----------
Ohio	204	204	204	202	202	202
Oklahoma	300	300	100	100	100	100
Pennsylvania	34,668	34,375	32,135	27,552	22,790	17,445
Tennessee	1,675	1,605	1,465	1,415	723	723
Utah	819	819	819	819	819	819
Virginia	3,124	2,914	3,014	2,914	1,742	1,642
Washington	332	332	332	235	190	80
West Virginia	7,847	7,153	6,899	4,408	2,938	2,518
	57,587	52,558	49,795	41,288	30,082	23,907

[1] The unusually large reduction in number of beehive ovens in 1929 was partly due to a change in the form of inquiry. (See text.)

TABLE 22.—*Coke ovens completed and abandoned in 1929 and 1930 and total number in existence and under construction at end of year, by States*

State	Plants in existence Dec. 31	Ovens						
		New [1]		Abandoned during year	In existence Dec. 31		Under construction Dec. 31	
		Number	Capacity per day (net tons of coke)		Number	Capacity per day (net tons of coke)	Number	Capacity per day (net tons of coke)
1929								
By-product:								
Alabama	8	------	------	------	1,388	16,412	------	------
Colorado	1	------	------	------	120	1,700	------	------
Connecticut	1	------	------	------	61	(2)	------	------
Illinois	8	21	150	53	905	13,265	45	650
Indiana	7	114	1,446	------	1,498	20,451	------	------
Kentucky	1	------	------	------	108	(2)	------	------
Maryland	1	------	------	60	300	4,140	61	848
Massachusetts	3	------	------	------	381	2,369	82	1,856
Michigan	7	------	------	------	576	7,607	------	------
Minnesota	3	------	------	------	196	2,562	------	------
Missouri	1	------	------	------	64	(2)	------	------
New Jersey	2	------	------	------	207	2,525	------	------
New York	9	------	------	------	868	12,419	37	350
Ohio	15	15	101	24	1,811	25,204	------	------
Pennsylvania	13	185	3,135	------	3,420	44,170	158	2,671
Rhode Island	1	------	------	------	40	(2)	25	400
Tennessee	1	------	------	------	24	350	------	------
Utah	1	------	------	------	56	1,015	------	------
Washington	1	------	------	------	20	123	------	------
West Virginia	4	------	------	------	411	4,819	------	------
Wisconsin	2	15	84	108	195	(2)	------	------
Undistributed	------	------	------	------	------	5,709	------	------
Total	90	350	4,916	245	12,649	164,840	408	6,775
At merchant plants	43	150	2,029	53	3,408	39,024	144	2,606
At furnace plants	47	200	2,887	192	9,241	125,816	264	4,169
Beehive:								
Alabama	------	------	------	953	------	(3)	------	------
Colorado	2	------	------	1,120	378		------	------
Kentucky	1	------	------	408	200		------	------
New Mexico	------	------	------	584	------		------	------
Ohio	1	------	------	------	202		------	------
Oklahoma	1	------	------	------	100		------	------
Pennsylvania	102	------	------	5,066	22,790		------	------
Tennessee	4	------	------	692	723		------	------
Utah	1	------	------	------	819		------	------
Virginia	9	------	------	1,172	1,742		------	------
Washington	2	------	------	45	190		------	------
West Virginia	23	------	------	1,571	2,938		------	------
	146	------	------	[4] 11,611	30,082	(3)	------	------
1930								
By-product:								
Alabama	8	------	------	------	1,388	16,160	------	------
Colorado	1	31	533	------	151	2,233	------	------
Connecticut	1	------	------	------	61	(2)	------	------
Illinois	8	------	------	------	905	12,767	45	650
Indiana	6	------	------	86	1,412	19,440	138	2,400
Kentucky	1	------	------	------	108	(2)	------	------
Maryland	1	[5] 61	848	------	360	4,240	------	------
Massachusetts	3	149	2,575	100	430	4,542	------	------
Michigan	7	11	65	------	587	7,497	------	------
Minnesota	3	------	------	------	196	2,597	------	------
Missouri	1	------	------	------	64	(2)	------	------
New Jersey	2	------	------	5	202	2,485	------	------
New York	9	[6] 88	1,080	------	956	13,395	68	1,123
Ohio	15	------	------	------	1,811	24,833	25	350
Pennsylvania	13	158	2,954	100	3,478	45,700	------	------
Rhode Island	1	25	400	------	65	(2)	------	------

[1] Represents new construction. Does not include ovens repaired and put into commission.

[2] Included under "Undistributed."

[3] Data not available.

[4] See Table 21, note 1, and text.

[5] ovens completed but not put into operation.

[6] Includes 51 ovens completed but not put into operation.

TABLE 22.—*Coke ovens completed and abandoned in 1929 and 1930 and total number in existence and under construction at end of year, by States*—Continued

State	Plants in existence Dec. 31	Ovens						
		New		Abandoned during year	In existence Dec. 31		Under construction Dec. 31	
		Number	Capacity per day (net tons of coke)		Number	Capacity per day (net tons of coke)	Number	Capacity per day (net tons of coke)
1930								
By-product—Continued.								
Tennessee	1	--------	--------	--------	24	360	--------	--------
Utah	1	--------	--------	--------	56	1,015	--------	--------
Washington	1	--------	--------	--------	20	125	--------	--------
West Virginia	4	71	1,275	120	362	5,071	--------	--------
Wisconsin	2	--------	--------	--------	195	(2)	--------	--------
Undistributed	--------	--------	--------	--------	--------	5,945	--------	--------
Total	89	594	9,730	411	12,831	168,405	276	4,523
At merchant plants	42	319	4,995	127	3,429	42,071	93	1,473
At furnace plants	47	275	4,735	284	9,402	126,334	183	3,050
Beehive:								
Colorado	2	--------	--------	--------	378	(3)	--------	--------
Kentucky	--------	--------	--------	200	--------		--------	--------
Ohio	1	--------	--------	--------	202		--------	--------
Oklahoma	1	--------	--------	--------	100		--------	--------
Pennsylvania	85	--------	--------	5,673	17,445		--------	--------
Tennessee	4	--------	--------	--------	723		--------	--------
Utah	1	--------	--------	--------	819		--------	--------
Virginia	8	--------	--------	100	1,642		--------	--------
Washington	1	--------	--------	110	80		--------	--------
West Virginia	18	--------	--------	420	2,518		--------	--------
Total	121	--------	--------	6,503	23,907	(3)	--------	--------

[2] Included under "Undistributed."
[3] Data not available.

TABLE 23.—*List of by-product coke plants in the United States, December 31, 1930*

State	Town	Name of company operating plant	Type of plant [1]	Number of ovens	Type of oven	Year put in operation [2]
Alabama	Alabama City	Gulf States Steel Co	F	37	Koppers	1916
	Ensley	Semet-Solvay Co	M	240	Semet-Solvay	1898–1902
	Fairfield	Tennessee Coal, Iron & R. R. Co.	F	497	Koppers	1912–1928
	North Birmingham.	Sloss-Sheffield Steel & Iron Co.	F	120	Semet-Solvay	1920
	Tarrant	Alabama By-Products Corp.	M	149	Koppers	1920–1927
	Thomas	Republic Steel Corp	F	57	do	1925
	Tuscaloosa	Central Iron & Coal Co	F	60	Semet-Solvay	1906–1914
	Woodward	Woodward Iron Co	F	168	Koppers	1911–1914
	do	do	F	60	Wilputte	1917
Colorado	Pueblo	Colorado Fuel & Iron Co	F	151	Koppers	1918–1930
Connecticut	New Haven	Connecticut Coke Co	M	61	do	1928
Illinois	Chicago	Interlake Iron Corp	M	110	do	1925
	do	do	M	120	Semet-Solvay	1905–1915
	do	Peoples Gas Light & Coke Co.	M	105	Koppers	1921–22
	Granite City	St. Louis Gas & Coke Corp.	F	80	Roberts	1921
	Joliet	Illinois Steel Co	F	280	Koppers	1908–9
	Rockford	Rockford Gas Light & Coke Co.	M	21	do	1929
	South Chicago.	Wisconsin Steel Works	F	88	Wilputte	1919
	do	Youngstown Sheet & Tube Co.	F	70	Koppers	1928
	Waukegan	North Shore Coke & Chemical Co.	M	31	do	1928

[1] F, "Furnace plants," or plants associated with iron furnaces and steel works. M, "Nonfurnace plants," or "other plants" (see Tables 12–14), including merchant plants, plants associated with industries other than iron and steel. and plants supplying gas under contract for city use. Since the publication of the report for 1925 changes in classification of certain plants have been made to conform with changes in definition of what constitutes a furnace plant.
[2] The first and last years are given for those plants that have 2 or more installations.

TABLE 23.—*List of by-product coke plants in the United States, December 31, 1930*—Continued

State	Town	Name of company operating plant	Type of plant	Number of ovens	Type of oven	Year put in operation
Indiana	Fort Wayne	Northern Indiana Public Service Co.	M	19	Koppers	1925
	Gary	Illinois Steel Co	F	838	do	1911–1926
	Indiana Harbor.	Inland Steel Co	F	214	do	1913–1929
	do	Youngstown Sheet & Tube Co.	F	120	Semet-Solvay	1919
	Indianapolis	Citizens Gas Co	M	41	do	1913
	do	do	M	120	Wilputte	1918–1929
	Terre Haute	Indiana Consumers Gas & By-Products Co.	M	60	Koppers	1919–1926
Kentucky	Ashland	Ashland By-Product Coke Co.	M	108	Semet-Solvay	1913–1916
Maryland	Sparrows Point	Bethlehem Steel Co	F	360	Koppers	1914–[3]1930
Massachusetts	Everett	New England Fuel & Transportation Co.	M	200	United-Otto	1899
	do	do	M	55	Wilputte	1926
	do	do	M	149	Koppers	1930
	Framingham	West Boston Gas Co	M	15	do	1927
	Lynn	Lynn Gas & Electric Co	M	11	do	1925
Michigan	Battle Creek	Battle Creek Gas Co	M	18	do	1924–1927
	Detroit	Semet-Solvay Co	M	216	Semet-Solvay	1901–1917
	Flint	Consumers Power Co	M	29	Koppers	1927
	Fordson	Ford Motor Co	F	120	Semet-Solvay	1919
	do	do	F	120	Wilputte	1927
	Jackson	Consumers Power Co	M	26	Koppers	1925–1930
	Wyandotte	Michigan Alkali Co	M	39	do	1927
	Zilwaukee	Consumers Power Co	M	19	do	1924
Minnesota	Duluth	Minnesota Steel Co	F	90	do	1915–16
	St. Paul	Minnesota By-Product Coke Co.	M	65	do	1918–1928
	West Duluth	Interlake Iron Corp	F	41	do	1928
Missouri	St. Louis	Laclede Gas Light Co	M	56	do	1915
	do	do	M	8	Piette	1921
New Jersey	Camden	Camden Coke Co	M	37	Koppers	1921
	Kearney	Seaboard By-Product Coke Co.	M	165	do	1917–1925
New York	Buffalo	Donner-Hanna Coke Corp	F	201	do	1920–[3]1930
	do	Semet-Solvay Co	M	120	Semet-Solvay	1917–1927
	Geneva	Empire Gas & Electric Co	M	46	do	1904–1909
	Greenpoint	Brooklyn Union Gas Co	M	90	Koppers	1928
	Hunts Point	Consolidated Gas Co	M	74	do	1926
	Lackawanna	Bethlehem Steel Co	F	60	Semet-Solvay	1920
	do	do	F	171	Koppers	1924–1927
	Rochester	Rochester Gas & Electric Co.	M	97	do	1926–1930
	Troy	Hudson Valley Coke & Products Corp.	M	55	American-Foundation.	1925
	Utica	Utica Gas & Electric Co	M	42	Koppers	1924–1926
Ohio	Campbell	Youngstown Sheet & Tube Co.	F	306	do	1916–1918
	Canton	Republic Steel Corp	F	62	do	1916–1929
	Cleveland	American Steel & Wire Co	F	180	do	1918
	do	Corrigan-McKinney Steel Co.	F	204	do	1916
	do	Otis Steel Co	F	100	Semet-Solvay	1910–1913
	Hamilton	Hamilton Coke & Iron Co	F	45	Koppers	1928
	Ironton	Ironton By-Product Coke Co.	M	60	Semet-Solvay	1918
	Lorain	National Tube Co	F	208	Koppers	1918
	Massillon	Republic Steel Corp	F	49	do	1927
	Painesville	Diamond Alkali Co	M	43	do	1924–1927
	Portsmouth	Portsmouth By-Product Coke Co.	F	108	Semet-Solvay	1917
	Toledo	Interlake Iron Corp	F	94	Koppers	1916
	Warren	Trumbull-Cliffs Furnace Co.	F	64	do	1924–1927
	Youngstown	Republic Iron & Steel Co	F	204	do	1914–1926
	do	Youngstown Sheet & Tube Co.	F	84	do	1917
Pennsylvania	Aliquippa	Jones & Laughlin Steel Co	F	203	do	1926–1930
	Bethlehem	Bethlehem Steel Co	F	424	do	1918
	Chester	Philadelphia Electric Co	M	25	Roberts-Morrissey.	1925
	Clairton	Carnegie Steel Co	F	1,482	Koppers	1918–1927
	Erie	Interlake Iron Corp	F	37	Wilputte	1925
	Johnstown	Bethlehem Steel Co	F	154	Koppers	1915–1930
	do	do	F	120	Cambria	1906–1920
	do	do	F	88	Semet-Solvay	1921

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[3] The 1930 installation of new ovens was completed but not put into operation before the end of the year.

TABLE 23.—*List of by-product coke plants in the United States, December 31, 1930*—Continued

State	Town	Name of company operating plant	Type of plant	Number of ovens	Type of oven	Year put in operation
Pennsylvania—Continued.	Lebanon	Bethlehem Steel Co.	F	90	Semet-Solvay	1904–1921
	Midland	Pittsburgh Crucible Steel Co.	F	100	Koppers	1920
	Neville Island	Davison Coke & Iron Co.	F	70	do	1929
	Philadelphia	Philadelphia Coke Co.	M	74	do	1929
	Pittsburgh	Jones & Laughlin Steel Co.	F	300	do	1919–20
	do	do	F	60	Wilputte	1926
	Steelton	Bethlehem Steel Co.	F	40	Semet-Solvay	1907
	do	do	F	60	Koppers	1919
	Swedeland	Rainey-Wood Coke Co.	F	151	do	1919–1929
Rhode Island	Providence	Providence Gas Co.	M	65	do	1919–1930
Tennessee	Altonpark	Tennessee Products Corp.	M	24	Semet-Solvay	1915
Utah	Provo	Columbia Steel Corp.	F	56	Koppers	1924–1928
Washington	Seattle	Seattle Lighting Co.	M	20	Klönne	1914
West Virginia	Belle	Dupont Ammonia Corp.	M	46	Wilputte	1930
	East Steubenville.	Wheeling Steel Corp.	F	145	Koppers	1917–1926
	Fairmont	Domestic Coke Corp.	M	60	do	1920
	Weirton	Weirton Steel Co.	F	111	do	1923–1930
Wisconsin	Milwaukee	Milwaukee Coke & Gas Co.	M	80	Semet-Solvay	1901–1906
	do	do	M	100	Koppers	1921–22
	Sheboygan	Wisconsin Public Service Co.	M	15	do	1929

TABLE 24.—*By-product ovens under construction in the United States, December 31, 1930*

State	Town	Name of company operating plant	Number of ovens	Type of oven	Date of operation
Illinois	South Chicago	Wisconsin Steel Works	45	Koppers	
Indiana	Gary	Illinois Steel Co.	138	do	
New York	Hunts Point	Consolidated Gas Co.	37	do	January, 1931.
Do	Troy	Hudson Valley Fuel Corporation.	31	do	Do.
Ohio	Ironton	Ironton By-Product Coke Co.	25	Semet-Solvay	November, 1931.

TABLE 25.—*By-product ovens of each type at the end of the year, by States, in 1930*

State	Koppers [1]	Semet-Solvay	Wilputte	United Otto [2]	Cambria-Belgian	Roberts [3]	American Foundation	Klönne	Piette	Total
Alabama	908	420	60							1,388
Colorado	151									151
Connecticut	61									61
Illinois	617	120	88			80				905
Indiana	1,131	161	120							1,412
Kentucky		108								108
Maryland	360									360
Massachusetts	175		55	200						430
Michigan	131	336	120							587
Minnesota	196									196
Missouri	56								8	64
New Jersey	202									202
New York	675	226					55			956
Ohio	1,543	268								1,811
Pennsylvania	3,018	218	97		120	25				3,478
Rhode Island	65									65
Tennessee		24								24
Utah	56									56
Washington								20		20
West Virginia	316		46							362
Wisconsin	115	80								195
Total	9,776	1,961	586	200	120	105	55	20	8	12,831
At merchant plants	1,845	1,055	221	200		25	55	20	8	3,429
At furnace plants	7,931	906	365		120	80				9,402

[1] Includes the Koppers-Becker type.
[2] Includes the Otto-Hoffman type.
[3] Includes the Roberts-Morrissey type.

TABLE 26.—*List of beehive coke plants that produced coke in 1930*

State, county, and district	Operator	Name or location of works	Ovens in existence
Colorado:			
La Plata County	American Smelting & Refining Co	Cokedale	350
Las Animas	do	Durango	28
Pennsylvania:			
Allegheny Mountain and Allegheny Valley districts—			
Blair	Glen White Coal & Lumber Co	Glen White	90
Cambria	Taylor McCoy Coal & Coke Co	Gallitzin Shaft	212
Do	Vinton Colliery Co	Vinton Ideal	152
Connellsville district—			
Fayette	Bitner Coal Co	Bitner	66
Do	Corrado & Galiardi (Inc)	Nellie	32
Do	Elm Grove Coal Co	Elm Grove	35
Do	Hope Coke Co	Hope	38
Do	W. J. Rainey (Inc.)	Mount Braddock	160
Do	Rich Hill Coke Co	Rich Hill	100
Do	Pleasant Valley Mining Co	Oliver	1,108
Westmoreland	Brownfield Coal & Coke Co	Myers	32
Do	Hostetter-Connellvsille Coke Co	Hostetter	355
Do	Humphreys Coal & Coke Co	Humphreys	145
Do	Wineland-Gilmore Coal & Coke Co	Winmore	60
Lower Connellsville district—			
Fayette	Bourne-Fuller Coke Co	Searight	100
Do	Brownsville Coal & Coke Co	Mount Hope	296
Do	Century Coke Co	Century	125
Do	Connellsville Central Coke Co	Herbert	210
Do	Fayette Coke Co	Shamrock	160
Do	Hecla Coal & Coke Co	Crystal	118
Do	Lincoln Coal & Coke Co	Lincoln Mine	60
Do	McKeefrey Coal Co	Geneva	202
Do	Monessen Coal & Coke Co	Alicia	400
Do	Puritan Coke Co	Puritan	476
Do	W. J. Rainey (Inc.)	Allison, Nos. 1 and 2	493
Do	Republic Coal & Coke Co	Freedom	34
Do	Thompson-Connellsville Coke Co	Thompson, No. 2	376
Do	Tower Hill Connellsville Coke Co	Tower Hill	505
Do	Waltersburg Coke Co	Edna	30
Do	Washington Coal & Coke Co	Washington	600
Do	Whyel Coke Co	Donald	160
Pittsburgh district—Beaver	Jones & Laughlin Steel Co	Aliquippa	488
Upper Connellsville district—			
Indiana	Graceton Coal & Coke Co	Graceton	202
Do	Potter Coal & Coke Co	Potter	300
Westmoreland	Atlantic Crushed Coke Co	Atlantic, No. 2	80
Do	Baton Coal Co	Wilpen	102
Do	Saxman Coal & Coke Co	Saxman, No. 2	50
Do	Westmoreland-Connellsville Coal & Coke Co.	Fort Palmer	160
Other districts—			
Bedford	Colonial Iron Co	Colonial	216
Indiana	Rochester & Pittsburgh Coal Co	Ernest	278
Westmoreland	Keystone Coal & Coke Co	Salem	280
Do	Jamison Coal & Coke Co	Jamison, No. 4	180
Tennessee:			
Grundy	Sewanee Fuel & Iron Co	Coalmont	90
Morgan	Brushy Mt. Coal Mines	Petros	140
Roane	Roane Iron Co	Rockwood	200
Utah: Carbon	Utah Fuel Co	Sunnyside	819
Virginia:			
Wise	Christie Coal Co	Esserville	122
Do	Hawthorne Coal Co	Hawthorne	50
Do	Norton Coal Co	Norton	100
Do	Stonega Coke & Coal Co	Stonega	350
Do	Virginia Iron, Coal & Coke Co	Toms Creek	300
Do	Wise Coal & Coke Co	Dorchester	170
Washington: Pierce	Wilkeson Coal & Coke Co	Wilkeson	80
West Virginia:			
Flat Top district—			
McDowell	Pulaski Iron Co	Pulaski	445
Mercer	Crystal Coal & Coke Co	Crystal	100
Kanawha district—			
Fayette	Kanawha & Hocking Coal & Coke Co	Carbondale	302
Do	do	Longacre	115
Do	do	Boomer	166

TABLE 26.—*List of beehive coke plants that produced coke in 1930*—Continued

State, county, and district	Operator	Name or location of works	Ovens in existence
West Virginia—Continued.			
New River district—			
Fayette	Babcock Coal & Coke Co.	Sewell	193
Do	Fire Creek Coal & Coke Co.	Fire Creek	81
Do	Gauley Mountain Coal Co.	Gauley Mountain	148
Do	New River & Pocahontas Consolidated Coal Co.	Kay Moor	79
Do	Turkey Knob Coal Co.	Turkey Knob	[1] 100
Upper Monongahela district: Preston.	Preston County Coke Co.	Cascade	194

[1] Abandoned after producing.

CAPACITY OF BY-PRODUCT OVENS

TABLE 27.—*Estimated annual potential production of coke and coal required for charge of by-product coke ovens in the United States, 1928–1930, when operated at different percentages of maximum capacity, in millions of net tons*

Percentage of maximum capacity	1928				1929				1930			
	Ovens completed Dec. 31		Including ovens under construction		Ovens completed Dec. 31		Including ovens under construction		Ovens completed Dec. 31		Including ovens under construction	
	Coke	Coal [1]	Coke	Coal [1]	Coke	Coal [1]	Coke	Coal [1]	Coke	Coal [1]	Coke	Coal [1]
100	59.6	85.1	60.4	86.3	60.2	86.0	62.6	89.4	61.5	87.9	63.1	90.1
90	53.6	76.6	54.4	77.7	54.2	77.4	56.3	80.5	55.4	79.1	56.8	81.1
85	50.7	72.3	51.3	73.4	51.2	73.1	53.2	76.0	52.3	74.7	53.6	76.6
75	44.7	63.8	45.3	64.7	45.2	64.5	47.0	67.1	46.1	65.9	47.3	67.6
50	29.8	42.6	30.2	43.2	30.1	43.0	31.3	44.7	30.8	44.0	31.6	45.1

[1] Coal for charge estimated on basis of 70 per cent yield in coke.

TABLE 28.—*Relation (per cent) of production to maximum capacity at by-product coke plants, 1925–1930, by months*

	1925	1926	1927	1928	1929	1930		1925	1926	1927	1928	1929	1930
January	86.0	94.6	84.5	80.4	88.6	82.8	August	77.8	88.3	79.8	82.8	93.6	69.2
February	86.0	96.4	85.4	82.2	91.3	87.5	September	80.9	88.7	80.8	84.3	91.9	66.7
March	85.7	93.8	87.2	83.2	93.0	86.6	October	82.0	88.5	76.4	86.3	92.3	64.9
April	84.9	89.5	84.8	82.6	92.8	85.7	November	88.5	88.9	74.2	86.8	89.0	60.5
May	80.9	89.0	83.9	83.5	94.0	82.7	December	90.6	84.7	74.6	87.8	83.1	57.5
June	80.3	88.4	82.3	83.2	93.9	79.2							
July	78.0	89.3	79.3	81.0	93.0	72.3	The year	83.5	89.9	80.9	83.7	91.4	73.5

QUANTITY AND COST OF COAL CHARGED

Although the quantity of coal used in the manufacture of coke has fluctuated widely in the past decade, the proportion of the total output of bituminous coal carbonized each year has remained remarkably constant, ranging from 12 to 16 per cent. In 1930 the coke ovens in the United States consumed 69,805,465 tons, or 15.1 per cent of the total output, of bituminous coal. Of this amount 65,521,321 tons were used in the by-product ovens. (See Table 29.)

Increasing interest in the marketing of coal has led to a demand for current figures of the quantity of coal required by the major industries month by month. Statistics of the quantity charged in by-product ovens therefore have been published by the bureau monthly since March, 1929, in the Current Trend of Consumption Analysis, issued as an appendix to the Weekly Coal Report. A background to this current analysis is afforded by Table 30.

TABLE 29.—*Coal used in manufacture of coke in the United States, 1918–1930, in net tons*

[For comparable figures back to 1880 see Coke and By-Products in 1925, p. 558]

Year	By-product	Beehive	Total	Year	By-product	Beehive	Total
1918	36, 867, 721	48, 160, 297	85, 028, 018	1925	57, 109, 651	17, 422, 581	74, 532, 232
1919	35, 857, 419	29, 730, 499	65, 587, 918	1926	63, 646, 610	19, 224, 500	82, 871, 110
1920	44, 204, 996	31, 985, 836	76, 190, 832	1927	63, 239, 773	11, 208, 115	74, 447, 888
1921	28, 713, 111	8, 475, 446	37, 188, 557	1928	70, 165, 906	7, 017, 974	77, 183, 880
1922	41, 052, 670	13, 285, 868	54, 338, 538	1929	76, 758, 958	10, 027, 516	86, 786, 474
1923	54, 275, 577	30, 084, 366	84, 359, 943	1930	65, 521, 321	4, 284, 144	69, 805, 465
1924	49, 061, 339	15, 914, 310	64, 975, 649				

TABLE 30.—*Coal consumed in coke ovens, 1928–1930, by months, in net tons*

[For figures 1912 to 1927, inclusive, see Coke and By-Products in 1928, pp. 731–733]

Month	1928			1929			1930		
	By-product	Beehive	Total	By-product	Beehive	Total	By-product	Beehive	Total
January	5, 673, 000	601, 000	6, 274, 000	6, 250, 200	798, 600	7, 048, 800	6, 043, 800	490, 700	6, 534, 500
February	5, 419, 000	625, 000	6, 044, 000	5, 870, 200	734, 300	6, 604, 500	5, 760, 600	430, 600	6, 191, 200
March	5, 917, 000	717, 000	6, 634, 000	6, 621, 200	889, 800	7, 511, 000	6, 323, 100	445, 500	6, 768, 600
April	5, 713, 000	605, 000	6, 318, 000	6, 395, 400	779, 300	7, 174, 700	6, 112, 400	462, 400	6, 574, 800
May	5, 968, 000	603, 000	6, 571, 000	6, 693, 900	995, 900	7, 689, 800	6, 134, 000	416, 800	6, 550, 800
June	5, 766, 000	486, 000	6, 252, 000	6, 471, 000	1, 004, 500	7, 475, 500	5, 689, 000	400, 900	6, 089, 900
July	5, 693, 000	437, 000	6, 130, 000	6, 620, 300	1, 000, 200	7, 620, 500	5, 433, 700	328, 800	5, 762, 500
August	5, 815, 000	464, 000	6, 279, 000	6, 662, 000	936, 900	7, 598, 900	5, 241, 400	259, 700	5, 501, 100
September	5, 761, 000	503, 000	6, 264, 000	6, 335, 700	840, 500	7, 176, 200	4, 902, 400	257, 500	5, 159, 900
October	6, 142, 000	673, 000	6, 815, 000	6, 623, 200	783, 600	7, 406, 800	4, 942, 400	272, 500	5, 214, 900
November	6, 015, 000	667, 000	6, 682, 000	6, 208, 400	689, 300	6, 897, 700	4, 513, 200	256, 700	4, 769, 900
December	6, 284, 000	637, 000	6, 921, 000	6, 007, 500	574, 600	6, 582, 100	4, 425, 300	262, 100	4, 687, 400
	70, 166, 000	7, 018, 000	77, 184, 000	76, 759, 000	10, 027, 500	86, 786, 500	65, 521, 300	4, 284, 200	69, 805, 500

Table 33 and Figure 15 trace the relative values of the coke and by-products and the cost of coking coal, all reckoned per ton of coke produced. Thus, in 1913 the average value of by-product coke was $3.83, the value of the by-products per ton of coke was $1.41, and the cost of coal per ton was $3.27. In 1930 the value of the coke had risen to $4.42, the value of the by-products per ton of coke to $3.71, and the cost of coal per ton of coke to $5.05. These figures, of course, represent merely the gross value of the products and a single item of cost; they take no account of the other costs of manufacture, such as wages, salaries, purchased electric power, insurance, taxes, and fixed charges on a very large investment. No data on total costs and therefore on profits have been collected, but the diagram indicates clearly the trends of the market. Particularly important to the coke producers were the shifts in the values of the several by-products. (See fig. 25, p. 563.) Increases in the values of tar and gas have more than offset a decline in the value of the benzols and ammonia, and the gross value of all of the by-products reckoned per ton of coke is now higher than before the war.

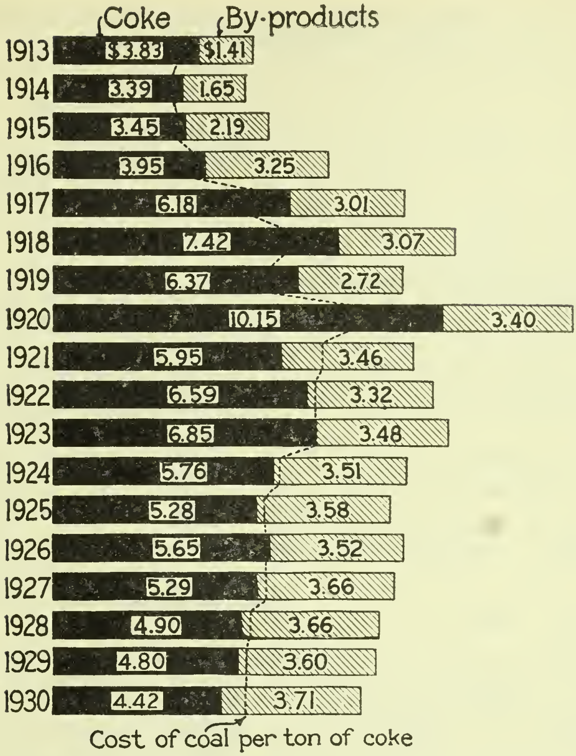

FIGURE 15.—Average value of by-product coke, gross value of by-products, and cost of coal per ton of coke produced. It should be noted that these figures represent the gross values of the products and that there are many other expenses besides the cost of coking coal, including other materials, wages, salaries, purchased electric power, rents, insurance, taxes, and fixed charges on a large investment. No data on total costs or profits have been collected

TABLE 31.—*Total quantity and value at ovens of coal used in the manufacture of coke, by States, 1929 and 1930*

State	Coal used (net tons)	Cost of coal		Coal per ton of coke	
		Total	Per ton of coal	Net tons	Cost
1929					
By-product plants:					
Alabama	6,708,774	$16,679,293	$2.49	1.41	$3.51
Colorado	830,748	(1)	(1)	1.47	------
Illinois	5,984,119	25,653,161	4.29	1.42	6.09
Indiana	8,748,928	40,330,893	4.61	1.36	6.27
Maryland	1,914,048	(1)	(1)	1.37	------
Massachusetts	1,126,370	5,292,465	4.70	1.45	6.82
Michigan	3,760,441	16,142,910	4.29	1.40	6.01
Minnesota	1,062,179	5,354,154	5.04	1.42	7.16
New Jersey	1,248,662	(1)	(1)	1.39	------
New York	6,183,918	26,090,898	4.22	1.44	6.08
Ohio	12,316,686	40,742,493	3.31	1.45	4.80
Pennsylvania	21,643,559	59,014,913	2.73	1.49	4.07
Tennessee	160,842	485,027	3.02	1.42	4.29
Utah	493,945	(1)	(1)	1.84	------
Washington	65,845	346,170	5.26	1.61	8.47
West Virginia	2,056,475	4,946,851	2.41	1.44	3.47

[1] Included under "Undistributed."

TABLE 31.—*Total quantity and value at ovens of coal used in the manufacture of coke, by States, 1929 and 1930*—Continued

State	Coal used (net tons)	Cost of coal		Coal per ton of coke	
		Total	Per ton of coal	Net tons	Cost
1929					
By-product plants—Continued.					
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	2, 453, 419	$9, 505, 625	$3. 87	1. 38	$5. 34
Undistributed	------	18, 347, 408	4. 09	------	------
Total	76, 758, 958	268, 932, 261	3. 50	1. 44	5. 04
At merchant plants	17, 142, 070	72, 350, 677	4. 22	1. 41	5. 95
At furnace plants	59, 616, 888	196, 581, 584	3. 30	1. 45	4. 79
Beehive plants:					
Colorado	237, 926	(1)	(1)	1. 52	------
Ohio and Pennsylvania	8, 195, 528	15, 065, 398	1. 84	1. 53	2. 82
Tennessee	169, 385	319, 977	1. 89	1. 77	3. 35
Utah	23, 361	(1)	(1)	1. 66	------
Virginia	527, 280	888, 761	1. 69	1. 67	2. 82
Washington	34, 894	157, 021	4. 50	1. 35	6. 08
West Virginia	839, 142	1, 246, 705	1. 49	1. 69	2. 52
Undistributed	------	738, 478	2. 83	------	------
	10, 027, 516	18, 416, 340	1. 84	1. 55	2. 85
1930					
By-product plants:					
Alabama	5, 621, 183	13, 409, 394	2. 39	1. 41	3. 37
Colorado	552, 639	(1)	(1)	1. 46	------
Illinois	5, 144, 535	22, 228, 778	4. 32	1. 44	6. 22
Indiana	6, 899, 911	31, 186, 754	4. 52	1. 38	6. 24
Maryland	1, 628, 815	(1)	(1)	1. 39	------
Massachusetts	1, 234, 068	5, 694, 430	4. 61	1. 43	6. 59
Michigan	3, 690, 540	14, 631, 053	3. 96	1. 42	5. 62
Minnesota	937, 738	4, 664, 342	4. 97	1. 46	7. 26
New Jersey	1, 276, 961	(1)	(1)	1. 39	------
New York	5, 566, 445	23, 253, 167	4. 18	1. 45	6. 06
Ohio	9, 102, 876	31, 670, 733	3. 48	1. 48	5. 15
Pennsylvania	18, 776, 490	50, 538, 212	2. 69	1. 50	4. 04
Tennessee	137, 706	415, 556	3. 02	1. 37	4. 14
Utah	414, 358	(1)	(1)	1. 84	------
Washington	59, 837	311, 880	5. 21	1. 65	8. 60
West Virginia	2, 121, 745	4, 622, 078	2. 18	1. 43	3. 12
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	2, 355, 474	9, 505, 041	4. 04	1. 39	5. 62
Undistributed	------	15, 656, 357	4. 04	------	------
Total	65, 521, 321	227, 787, 775	3. 48	1. 45	5. 05
At merchant plants	16, 941, 190	71, 255, 979	4. 21	1. 41	5. 94
At furnace plants	48, 580, 131	156, 531, 796	3. 22	1. 46	4. 71
Beehive plants:					
Colorado	122, 000	(1)	(1)	1. 54	------
Pennsylvania	3, 018, 669	4, 944, 897	1. 64	1. 50	2. 46
Tennessee	47, 469	57, 510	1. 21	1. 86	2. 25
Utah	11, 093	(1)	(1)	1. 70	------
Virginia	360, 896	575, 537	1. 59	1. 64	2. 61
Washington	15, 928	77, 060	4. 84	1. 30	6. 29
West Virginia	708, 089	1, 019, 057	1. 44	1. 68	2. 42
Undistributed	------	384, 728	2. 89	------	------
	4, 284, 144	7, 058, 789	1. 65	1. 54	2. 54

[1] Included under "Undistributed."

TABLE 32.—*Average cost per net ton of coal charged into by-product coke ovens, by States, 1920–1930*

State	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Alabama	$4.10	$3.29	$2.47	$2.95	$2.85	$2.68	$2.65	$2.64	$2.62	$2.49	$2.39
Illinois	6.49	5.90	5.92	5.78	5.16	4.89	4.75	4.67	4.30	4.29	4.32
Indiana	5.92	5.89	5.70	5.77	5.23	5.03	5.00	5.05	4.75	4.61	4.52
Kentucky	4.84	4.20	4.28	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Massachusetts	(1)	(1)	(1)	(1)	(1)	(1)	(1)	4.92	4.86	4.70	4.61
Michigan	7.03	5.77	5.65	5.79	5.34	4.76	4.75	4.70	4.37	4.29	3.96
Minnesota	6.50	7.12	6.79	6.74	5.89	5.33	5.33	5.48	5.31	5.04	4.97
New York	6.20	5.86	5.60	5.31	4.75	4.51	4.60	4.71	4.33	4.22	4.18
Ohio	5.75	4.94	5.04	4.84	4.04	3.82	3.86	3.88	3.43	3.31	3.48
Pennsylvania	3.91	3.39	3.78	3.77	3.19	2.97	2.97	2.95	2.77	2.73	2.69
Tennessee	4.30	3.84	3.84	3.50	3.33	3.00	3.02	3.31	3.12	3.02	3.02
Washington	6.63	6.53	5.50	5.44	5.39	5.32	5.32	5.21	5.28	5.26	5.21
West Virginia	4.82	3.89	4.07	4.03	3.82	3.06	3.07	2.84	2.57	2.41	2.18
Average	5.40	4.84	4.73	4.76	4.13	3.86	3.88	3.87	3.57	3.50	3.48
Cost of coal per ton of coke	7.73	7.03	6.81	6.85	5.95	5.52	5.55	5.57	5.18	5.04	5.05

[1] Not at liberty to publish.

TABLE 33.—*Cost of coal and value of all products per net ton of coke produced, 1913–1930*

[All figures reduced to value per net ton of coke produced]

Year	By-product coke					Beehive coke		
	Value of coke per ton [1]	Per ton of coke				Value of coke per ton [1]	Per ton of coke	
		Value of all by-products	Total value of products	Cost of coal	Excess, products over coal		Cost of coal	Excess, coke ove coal
1913	$3.83	$1.41	$5.24	$3.27	$1.97	$2.39	$1.75	$0.64
1914	3.39	1.65	5.04	3.19	1.85	2.15	1.67	.48
1915	3.45	2.19	5.64	3.24	2.40	2.07	1.61	.46
1916	3.95	3.25	7.20	3.62	3.58	2.69	1.96	.73
1917	6.18	3.01	9.19	5.20	3.99	4.81	3.17	1.64
1918	7.42	3.07	10.49	6.00	4.49	6.21	3.65	2.56
1919	6.37	2.72	9.09	5.65	3.44	5.15	3.39	1.76
1920	10.15	3.40	13.55	7.73	5.82	7.94	4.90	3.04
1921	5.95	3.46	9.41	7.03	2.38	5.45	3.82	1.63
1922	6.59	3.32	9.91	6.81	3.10	5.84	4.05	1.79
1923	6.85	3.48	10.33	6.85	3.48	5.98	3.97	2.01
1924	5.76	3.51	9.27	5.95	3.32	4.70	3.44	1.26
1925	5.28	3.58	8.86	5.52	3.34	4.56	3.14	1.42
1926	5.65	3.52	9.17	5.55	3.62	4.57	3.08	1.49
1927	5.29	3.66	8.95	5.57	3.38	4.20	3.24	.96
1928	4.90	3.66	8.56	5.18	3.38	3.63	2.93	.70
1929	4.80	3.60	8.40	5.04	3.36	3.49	2.85	.64
1930	4.42	3.71	8.13	5.05	3.08	3.43	2.54	.89

[1] Includes operators' statements of the value of coke consumed by them in associated enterprises but not sold, except that in 1918 and 1920 the value of such coke was estimated for each State at the average value for that State of the part of the product reported sold.

PREPARATION AND SOURCE OF COAL CHARGED

WASHED AND UNWASHED COAL

Where the coals available for coke manufacture contain an undue proportion of ash or sulphur they are usually washed before being charged in the coke ovens. Table 34 shows the quantity of washed and unwashed coal consumed in the coke ovens of each State.

Producers of coking coal were among the pioneers in the development of the art of washing, and as early as 1890 a considerable part of the coal made into coke was washed. The proportion of washed coal rose from 7.1 per cent in 1890 to a high point of 23.3 per cent in 1908 and since has declined slightly.

These figures include all washed coal, whether cleaned at the mine by the coal operator or at the ovens by the coal producer. Properly they ought also to include coal cleaned by the several pneumatic processes that have recently been introduced and are technically considered forms of coal washing. The questionnaire used by the bureau, however, has not specifically asked that pneumatically cleaned coal be reported as washed. It is clear that some operators did so report it, others probably did not. Since about 1925, therefore, when the tonnage of pneumatically cleaned coal began to be significant, the figures of washed coal charged may not be complete.

As it stands, Table 34 shows that 10,982,930 tons of washed coal was charged in by-product ovens and 968,242 tons in beehive ovens. The States in which washed coal was used most were Alabama, Colorado, and parts of Pennsylvania.

TABLE 34.—*Washed and unwashed coal used in the manufacture of by-product and beehive coke, by States in which used, in 1930, in net tons*

State	Washed	Unwashed	Total
By-product ovens:			
Alabama	[1] 5,621,183	(1)	5,621,183
Colorado	552,639		552,639
Illinois	564,061	4,580,474	5,144,535
Indiana		6,899,911	6,899,911
Maryland		1,628,815	1,628,815
Massachusetts	25,852	1,208,216	1,234,068
Michigan	254,049	3,436,491	3,690,540
Minnesota		937,738	937,738
New Jersey		1,276,961	1,276,961
New York	365,635	5,200,810	5,566,445
Ohio	1,265,328	7,837,548	9,102,876
Pennsylvania	2,136,640	16,639,850	18,776,490
Tennessee	137,706		137,706
Utah		414,358	414,358
Washington	59,837		59,837
West Virginia		2,121,745	2,121,745
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	(2)	2,355,474	2,355,474
Total	[1 2] 10,982,930	[1 2] 54,538,391	65,521,321
At merchant plants	1,667,217	15,273,973	16,941,190
At furnace plants	9,237,825	39,342,306	48,580,131
Beehive ovens:			
Colorado	111,649	10,351	122,000
Pennsylvania	561,404	2,457,265	3,018,669
Tennessee	47,469		47,469
Utah		11,093	11,093
Virginia		360,896	360,896
Washington	15,928		15,928
West Virginia	231,792	476,297	708,089
	968,242	3,315,902	4,284,144

[1] A small amount of unwashed coal, which can not be shown separately, is included with the washed.

[2] A small amount of washed coal, which can not be shown separately, is included with the unwashed.

SOURCE OF BY-PRODUCT COAL IN 1930

Because of the wide interest in supplies of coal suitable for the manufacture of by-product coke the bureau asks each operator for a statement of the source of the coal charged during the year. In Table 35 the quantities reported are grouped by field of origin in as great detail as the nature of the replies permits. Considerable tonnages were so reported that they could not be accurately separated by fields, and it is hoped that in future the analysis can be made more detailed and exact.

The Appalachian fields remain the great source of by-product coal, but it is interesting to note that 565,362 tons were drawn from southern Illinois, 577,425 tons from the Trinidad field of Colorado, 402,140 from Carbon County, Utah, and 59,528 from Pierce County, Wash.

Table 36 analyzes the distribution of by-product coking coal from State where produced to State where used.

TABLE 35.—*Coal used in the manufacture of by-product coke in 1930, by field of origin, in net tons*

[Based upon detailed reports from each coke plant. The difference between these totals and those shown in Tables 3, 30, etc., is due to change in stock, loss of weight in handling, and the fact that these sometimes represent purchases during the year rather than actual consumption]

State and district where coal was produced	Total used	States where coal was consumed—in order of importance
Alabama	5,865,155	Alabama.
Colorado:		
Trinidad	577,425	Colorado.
Pitkin County	12,218	Utah.
Fremont, Garfield, and Gunnison Counties.	51,417	Colorado.
Illinois: Southern	565,362	Illinois.
Kentucky:		
Eastern Kentucky—		
Elkhorn	1,922,866	Michigan, Ohio, Indiana, New York, Illinois, Kentucky, Missouri, Minnesota, Massachusetts.
Harlan	4,959,234	Indiana, Michigan, Illinois, Ohio, Minnesota.
Pond Creek and Alma	620,686	Ohio.
Thacker	224,129	Indiana, Wisconsin, Illinois.
Pennsylvania:		
Connellsville	16,592,258	Pennsylvania, Ohio, West Virginia, Illinois, Michigan, New York, Minnesota, Wisconsin.
Pittsburgh	9,631,093	Pennsylvania, New York, Ohio, Massachusetts, Minnesota, Michigan, Wisconsin, Illinois, New Jersey.
Westmoreland	695,839	Maryland, New York.
Freeport	1,219,928	West Virginia, Indiana, Michigan.
Central Pennsylvania, high volatile	825,750	Pennsylvania, New York, Maryland.
Central Pennsylvania, low volatile	248,095	Pennsylvania, New York.
Somerset	289,710	Ohio, Pennsylvania.
Tennessee	108,029	Tennessee.
Utah: Carbon County	402,140	Utah.
Virginia: Wise, Lee, and Dickenson Counties.[1]	1,186,098	New York, New Jersey, Massachusetts, Missouri.
Washington: Pierce County	59,528	Washington.
West Virginia:		
Northern	2,785,858	Pennsylvania, Ohio, Maryland, West Virginia, New Jersey.
Kanawha and Logan	4,728,580	Illinois, Indiana, Michigan, Wisconsin, Ohio, Massachusetts, New York, Rhode Island, Kentucky, West Virginia, Missouri, Minnesota.
Pocahontas [1]	9,175,252	Indiana, Ohio, Illinois, New York, Michigan, Pennsylvania, Maryland, West Virginia, Wisconsin, Minnesota, Kentucky, Connecticut, Missouri, Alabama, Tennessee.
New River and Winding Gulf	2,999,469	Illinois, Pennsylvania, New Jersey, Connecticut, Massachusetts, New York, Minnesota, Rhode Island, Missouri.
Thacker	18,694	Indiana.
Miscellaneous	459	Missouri, Minnesota.
	65,765,272	

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[1] Coal from the extension of the Pocahontas field in Tazewell County, Va., is included under West Virginia (Pocahontas).

TABLE 36.—*Coal used in the manufacture of by-product coke in 1930, by State where produced and State where consumed, in net tons*

State where coal was used	Coal produced in—				
	Alabama	Colorado	Illinois	Kentucky	Pennsylvania
Alabama	5, 865, 155				
Colorado		628, 842			
Illinois			565, 362	1, 312, 004	503, 591
Indiana				2, 569, 228	382, 166
Maryland					520, 264
Massachusetts				40, 938	372, 197
Michigan				(1)	(1)
Minnesota				247, 507	395, 903
New Jersey					25, 908
New York				(1)	3, 320, 282
Ohio				1, 323, 338	5, 237, 609
Pennsylvania					16, 610, 028
Tennessee					
Utah		12, 218			
Washington					
West Virginia					1, 587, 725
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin				332, 821	(1)
Undistributed				1, 901, 079	659, 358
	5, 865, 155	641, 060	565, 362	7, 726, 915	29, 615, 031

State where coal was used	Coal produced in—					
	Tennessee	Utah	Virginia [2]	Washington	West Virginia [2]	Total [3]
Alabama					66, 528	5, 931, 683
Colorado						628, 842
Illinois					2, 727, 597	5, 108, 554
Indiana					3, 948, 759	6, 900, 153
Maryland					1, 108, 551	1, 628, 815
Massachusetts			77, 019		741, 044	1, 231, 198
Michigan					1, 373, 375	1, 373, 375
Minnesota					294, 328	937, 738
New Jersey			539, 617		638, 489	1, 204, 014
New York			(1)		1, 453, 781	4, 774, 063
Ohio					2, 542, 583	9, 103, 530
Pennsylvania					2, 165, 306	18, 775, 334
Tennessee	108, 029				30, 761	138, 790
Utah		402, 140				414, 358
Washington				59, 528		59, 528
West Virginia					549, 172	2, 136, 897
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin			(1)		1, 955, 680	2, 288, 501
Undistributed			569, 462			3, 129, 899
	108, 029	402, 140	1, 186, 098	59, 528	19, 595, 954	65, 765, 272

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[1] Included under "Undistributed."

[2] Coal from the extension of the Pocahontas field in Tazewell County, Va., is included under West Virginia.

[3] Difference between these totals and those shown in Tables 3, 30, etc., is due to change in stock, loss of weight in handling, and to the fact that these sometimes represent purchases made during the year rather than actual consumption.

YIELD OF COKE PER TON OF COAL

TABLE 37.—*Percentage yield of coke from coal in by-product and beehive ovens, by States, 1927–1930*

State	1927		1928		1929		1930	
	By-product	Beehive	By-product	Beehive	By-product	Beehive	By-product	Beehive
Alabama	70.4	----------	69.6	----------	70.9	----------	70.93	----------
Colorado	68.5	64.8	68.0	65.4	68.0	65.7	68.59	64.98
Georgia	----------	(1)	----------	(1)	----------	----------	----------	----------
Illinois	69.0	----------	68.8	----------	70.3	----------	69.52	----------
Indiana	74.5	----------	74.3	----------	73.8	----------	72.24	----------
Kentucky	(1)	(1)	(1)	(1)	(1)	----------	(1)	----------
Maryland	73.0	----------	72.5	----------	72.8	----------	71.77	----------
Massachusetts	68.1	----------	66.4	----------	69.0	----------	69.90	----------
Michigan	71.3	----------	70.6	----------	71.3	----------	70.55	----------
Minnesota	68.8	----------	69.2	----------	70.2	----------	68.38	----------
New Jersey	72.8	----------	72.1	----------	71.9	----------	71.95	----------
New Mexico	----------	----------	----------	----------	----------	----------	----------	----------
New York	70.4	----------	69.1	----------	69.5	----------	69.16	----------
Ohio	68.9	(1)	67.9	(1)	69.2	(2)	67.71	----------
Pennsylvania	66.3	65.5	66.3	65.4	66.9	[2] 65.5	66.73	66.63
Tennessee	75.3	56.4	74.7	59.8	70.4	56.6	72.94	53.66
Utah	61.9	59.7	55.0	57.7	54.2	60.2	54.39	58.66
Virginia	----------	60.0	----------	58.9	----------	59.7	----------	60.86
Washington	62.5	64.0	63.2	63.9	62.1	74.1	60.53	76.92
West Virginia	67.6	58.7	69.5	58.8	69.6	59.3	69.73	59.56
Average	69.4	64.3	68.9	64.0	69.6	64.5	68.98	64.80

[1] Not at liberty to publish data.

[2] Ohio included with Pennsylvania.

COKE BREEZE

The manufacture of coke produces appreciable percentages of coke breeze or screenings too fine for metallurgical or household use. Logically this material, which probably averages somewhat more than 12,000 B. t. u. per pound on a dry basis, should be considered part of the coke production because of its value as a fuel. Inclusion of this material, however, would not conform to the general trade usage. Moreover, present and past production could not then be accurately compared, for statistical records of breeze produced before 1916 are fragmentary. Hence, breeze is treated in this report as a by-product, and the term "coke" refers only to the larger material from which the screenings have been removed. The size of the material classed as breeze varies with the different plants, but it may be described roughly as corresponding to the steam sizes of anthracite. Table 38 indicates that in the beehive branch of the industry the problem of finding a profitable outlet for breeze remains unsolved. The quantity reported as produced in 1930 was only 85,622 tons, a small part of the total quantity of fine material resulting from the carbonization of the coal charged during the year. Limited amounts of the breeze produced in beehive ovens are used by the producer for steam raising and other purposes, and even smaller quantities are sold.

Uses ordinarily can be found for the breeze produced at by-product coke plants, and the amount wasted is negligible.

TABLE 38.—*Coke breeze recovered at coke plants, by States, in 1930*

State	Yield (per cent) of coal	Produced		Used by producer				Sold		On hand Dec. 31 (net tons)	Wasted (net tons)
				For steam raising		For other purposes					
		Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value		
By-product ovens:											
Alabama	4.22	237,310	$451,663	161,059	$199,654	7,679	$11,685	48,765	$56,280	65,343	16,023
Colorado	4.91	27,124	(1)	27,146	(1)					70	
Illinois	6.86	352,930	946,008	241,298	598,641	53,245	134,677	77,550	236,286	94,536	
Indiana	5.82	401,365	1,018,534	341,302	825,152	30,819	54,075	59,958	215,897	15,407	
Maryland	7.39	120,335	(1)	77,836	(1)	16,475	(1)	23,046	(1)	22,597	
Massachusetts	7.17	88,469	261,859	7,292	23,749	6,022	18,066	61,953	181,634	27,317	
Michigan	5.99	221,034	572,415	185,262	492,923	2,733	12,785	55,443	111,920	3,689	37
Minnesota	1.82	67,168	201,217	25,380	64,398	(1)	(1)	31,101	95,865	12,532	
New Jersey	4.09	52,183	(1)	43,318	(1)			806	(1)	12,470	
New York	5.18	288,300	733,737	221,269	572,302	37,960	107,503	45,432	90,226	18,562	
Ohio	8.00	727,857	1,581,889	511,210	884,858	34,312	71,411	224,568	720,205	52,711	
Pennsylvania	7.55	1,417,344	2,380,108	1,121,086	1,779,958	132,940	203,704	148,562	375,863	42,916	5,220
Tennessee	4.03	5,554	11,941	5,492	11,788					7,343	
Utah	11.30	46,835	(1)					37,610	(1)	47,668	
Washington	6.58	3,936	11,218	3,930	11,209	5	5	2	2		
West Virginia	4.44	94,168	106,033	82,233	89,427	(1)	(1)	9,454	13,608	16,252	4,054
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	7.86	185,200	563,304	129,161	281,024	33,844	204,412	17,332	51,857	21,158	
Undistributed			568,623		299,437	18,520	78,640		181,373		
Total	6.62	4,337,112	9,408,549	3,184,274	6,134,520	374,554	896,963	841,582	2,331,016	460,571	25,334
From merchant ovens	6.22	1,053,404	2,701,176	724,070	1,743,922	121,717	445,899	250,832	578,649	188,751	2,788
From furnace ovens	6.76	3,283,708	6,707,373	2,460,204	4,390,598	252,837	451,064	590,750	1,752,367	271,820	22,546
Beehive ovens:											
Colorado and Utah	[2] 2.09	2,564	4,458	1,634	3,668			931	792		
Pennsylvania	[2] 4.28	74,484	50,144	53,987	24,923	1,153	1,410	13,482	19,170	93,195	254
Virginia and West Virginia	[3] 2.81	8,574	4,564	3,930	393	377	1,247	2,210	2,452	20	2,057
Total	[2] 3.95	85,622	59,166	59,551	28,984	1,530	2,657	16,623	22,414	93,215	[3] 2,311

[1] Included under "Undistributed."
[2] Yield computed by dividing the production of the breeze at the few plants reporting by the quantity of coal charged at these plants.
[3] As reported; quantity produced but not used was undoubtedly greater. See Mineral Resources, 1922, Pt. II, pp. 726–727.

CONSUMPTION OF COKE

Records of the consumption of coke are important because of the light they throw on the trend of demand and hence on the prospects for future expansion of the industry. Projects for construction of new ovens should be considered carefully not only with regard to immediate requirements but also to the long-time growth of consumption.

The aggregate consumption of the country may be calculated easily by adding the production and imports, subtracting the exports, and allowing for changes in producers' stocks. This is done in Table 39 for each year from 1913 to the present. For 1930 the indicated United States consumption, calculated in this way, was 46,063,870 tons, as compared with 58,352,535 tons in 1929. The drop in consumption in 1930 from the high level of 1929 occurred in blast-furnace consumption, foundry use, and other industrial areas. Domestic coke consumption continued to rise.

TABLE 39.—*Quantity of coke consumed in the manufacture of pig iron and for other purposes, 1913–1930, net tons*

Year	Total production of coke	Imports	Exports	Net changes in stocks	Indicated United States consumption [1]	Consumed by iron furnaces [2]		Remainder consumed in other ways	
						Quantity	Per cent	Quantity	Per cent
1913	46, 299, 530	101, 212	987, 395	(3)	45, 413, 347	37, 192, 287	81. 9	8, 221, 060	18. 1
1914	34, 555, 914	133, 226	663, 585	(3)	34, 025, 555	27, 070, 856	79. 6	6, 954, 699	20. 4
1915	41, 581, 150	53, 222	895, 509	(3)	40, 738, 863	33, 224, 328	81. 6	7, 514, 535	18. 4
1916	54, 533, 585	54, 955	1, 174, 645	(3)	53, 413, 895	44, 431, 905	83. 2	8, 981, 990	16. 8
1917	55, 606, 828	24, 872	1, 409, 320	(3)	54, 222, 380	44, 493, 316	82. 1	9, 729, 064	17. 9
1918	56, 478, 372	30, 168	1, 687, 824	(3)	54, 820, 716	45, 703, 594	83. 4	9, 117, 122	16. 6
1919	44, 180, 557	16, 486	716, 956	(3)	43, 480, 087	35, 250, 943	81. 1	8, 229, 144	18. 9
1920	51, 345, 043	41, 143	919, 802	(3)	50, 466, 384	41, 976, 171	83. 2	8, 490, 213	16. 8
1921	25, 287, 622	30, 990	306, 755	(3)	25, 011, 857	18, 162, 147	72. 6	6, 849, 710	27. 4
1922	37, 124, 012	94, 228	511, 541	−805, 000	37, 511, 699	29, 213, 893	77. 9	8, 297, 806	22. 1
1923	56, 977, 534	85, 002	1, 237, 342	+651, 737	55, 173, 457	44, 761, 526	81. 1	10, 411, 931	18. 9
1924	44, 269, 605	82, 833	659, 350	−258, 020	43, 951, 108	34, 303, 060	78. 0	9, 648, 048	22. 0
1925	51, 266, 943	201, 579	953, 812	−854, 561	51, 369, 271	39, 241, 812	76. 4	12, 127, 459	23. 6
1926	56, 865, 537	284, 548	987, 260	+600, 021	55, 562, 804	40, 767, 456	73. 4	14, 795, 348	26. 6
1927	51, 092, 143	168, 859	806, 664	+580, 293	49, 874, 045	38, 380, 880	77. 0	11, 493, 165	23. 0
1928	52, 805, 828	147, 701	1, 097, 666	−38, 508	51, 894, 371	39, 458, 691	76. 0	12, 435, 680	24. 0
1929	59, 883, 845	119, 724	1, 238, 035	+412, 999	58, 352, 535	43, 601, 743	74. 7	14, 750, 792	25. 3
1930	47, 972, 021	132, 674	1, 003, 866	+1, 036, 959	46, 063, 870	32, 130, 070	69. 8	13, 933, 800	30. 2

[1] Production plus imports minus exports, plus or minus the decrease or increase, respectively, of the net changes in stocks.

[2] From Annual Report of American Iron and Steel Institute. Figures include coke consumed in the manufacture of ferro-alloys. Figures for 1926–1930 revised since last report to accord with final figures published by the Institute.

[3] Data not available.

For the principal branch of consumption, the smelting of iron in blast furnaces, a yearly record of the quantity actually used is kept by the iron companies themselves, and this record is shown in the sixth column of Table 39. In 1930 blast-furnace consumption was 32,130,070 tons. The downward trend of fuel consumption per ton of pig iron produced continued in 1930. As shown by Table 40 and Figure 16, the quantity of coking coal required to make a gross ton of iron declined from an average of 3,637.2 pounds in 1913 to 2,978.5 pounds in 1930. The decline is partly due to the increasing use of scrap, but also represents improvements in fuel efficiency in the blast furnace and improvements in the yield and quantity of coke.

Actual records of the tonnage used by other consumers are fragmentary and available only at long intervals. The total used for all other purposes may be calculated by subtracting from the indicated total consumption the quantity known to have been charged in iron furnaces. This is done in the eighth column of Table 39. The remainder includes the consumption in foundry work, in smelting nonferrous metals, in making water gas, in other industrial uses, and in domestic heating. The calculated total for these uses in 1930 was 13,933,800 tons or 30.2 per cent of the national consumption, as compared with 14,750,792 tons in 1929 and 8,221,060 tons in 1913. Thus, the consumption for purposes other than iron manufacture has continued to increase, except for the depression year 1930, while furnace demand has remained stationary or declined.

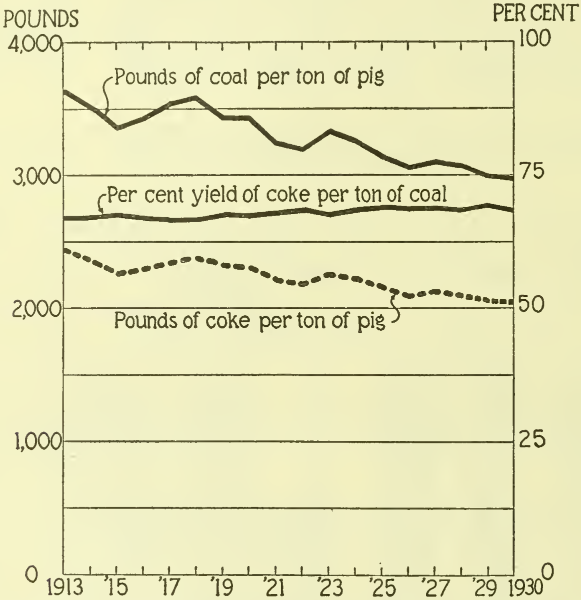

FIGURE 16.—Declining consumption of blast-furnace coke per gross ton of pig iron, 1913–1930. The quantity of coke consumed per ton of pig iron has been declining. At the same time, the yield of coke per ton of coal carbonized has increased slightly, so that the consumption of coking coal per ton of pig iron produced has declined from 3,637 pounds in 1913 to 2,979 pounds in 1930

To assist the student of the market the other sources of information on actual consumption of coke should be mentioned briefly. The quantity consumed in the manufacture of city gas is reported by the biennial Census of Manufactures.[4] The quantity consumed in other manufacturing industries appears in the decennial census of 1919[5] and again in 1929.[6]

In Weekly Coal Report 607, March 2, 1929, the Bureau of Mines began a new statistical service analyzing the current changes in the rate of consumption in the principal markets. Consumption of coal in by-product ovens is divided into eight districts, and monthly consumption is given for each district. The record of coal consumption in 1930 shows an almost continuous decline from month to month. The temporary increase in business in March was reflected by an increase in coal consumption for February and March. Consumption declined in all districts except New England, where the November and December output was considerably above the average for the year, due largely to installation of several new batteries of ovens. The largest declines occurred in the centers manufacturing metallurgical coke, which reflected the decline in the demand for iron and steel.

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[4] U. S. Bureau of the Census, Manufactures; The Gas and Coke Industries: 1927, p. 9. and 1929, p. 11.
[5] U. S. Bureau of the Census, Fourteenth Census, Manufactures: Vol. 8, 1919, pp. 131–141.
[6] In course of publication.

TABLE 40.—*Pounds of coke and of coking coal consumed per gross ton of pig iron made in the United States, 1913–1930*

Year	Pounds of coke per gross ton of pig iron and ferro-alloys[1]	Per cent yield of coke from coal	Calculated pounds coking coal per gross ton of pig iron and ferro-alloys	Year	Pounds of coke per gross ton of pig iron and ferro-alloys[1]	Per cent yield of coke from coal	Calculated pounds coking coal per gross ton of pig iron and ferro-alloy
1913	2,433.3	66.9	3,637.2	1922	2,176.3	68.3	3,186.4
1914	2,354.4	66.9	3,519.3	1923	2,243.3	67.5	3,323.4
1915	2,252.0	67.2	3,351.2	1924	2,212.0	68.1	3,248.2
1916	2,285.3	66.8	3,421.1	1925	2,150.4	68.8	3,125.6
1917	2,339.7	66.4	3,523.6	1926	2,091.2	68.6	3,048.4
1918	2,375.2	66.4	3,577.1	1927	2,122.3	68.6	3,093.7
1919	2,310.2	67.4	3,427.6	1928	2,088.5	68.4	3,053.4
1920	2,305.6	67.4	3,420.8	1929	2,058.6	69.0	2,983.5
1921	2,200.6	68.0	3,236.2	1930	2,046.8	68.7	2,978.5

[1] From Annual Statistical Report of American Iron and Steel Institute, 1930, p. 17. Beginning in 1926 the institute began to show the consumption per ton of pig iron only, excluding the furnaces making ferro-alloys. The results were 2,060.9 pounds in 1926; 2,094.1 in 1927; 2,059.3 in 1928; 2,030.9 in 1929; and 2,015.8 in 1930.

FURNACE, FOUNDRY, AND OTHER COKE

SOURCE OF INFORMATION

Another approach to the problem of measuring the consumption of coke is to ask the producer to state the purpose for which his output is consumed. Not all producers can furnish such information, especially for such of their product as is sold through middlemen, but the bureau does ask for the use to which that part of the output consumed by the producer is put and does ask, also, for separation of the sales into the broad classification "furnace," "foundry," "other industrial," and "domestic."

In this connection it must be remembered that the terms "furnace coke" and "foundry coke," as used in the trade, refer to the size and grade of the coke as well as to the use for which it may be intended. As explained more fully in Coke and By-Products in 1922, pages 729 and 730, by-product furnace coke is ordinarily run-of-oven coke from which the breeze and all small coke of less than, say, three-fourths inch in diameter have been removed. By-product foundry coke is ordinarily a blocky coke of maximum size much greater than that of furnace coke, from which all sizes under 2½ to 3 inches are screened out. Coke of smaller size than furnace or foundry (exclusive, however, of the breeze) is often called domestic coke. It may result from the screening of foundry or furnace coke, or where the principal demand is for domestic coke, it may be obtained by crushing the larger fragments. Other special sizes and grades may be prepared for special purposes. Thus, not all furnace coke finds its way to blast furnaces or all foundry coke to iron foundries proper, for either grade may be purchased by other classes of consumers.

Considering the form in which producers keep their records the bureau has adopted the following form of inquiry:

Disposal of large coke

	Net tons	Value at ovens
Used by producer, not sold:		
In blast furnaces		$
For other purposes (specify)		
Sold for furnace use (metallurgical only):		
To financially affiliated corporations		
To other merchant consumers		
Sold for foundry use		
Sold for domestic use		
Sold for industrial and other use		

Tables 41 to 44 analyze producers' replies to these questions, which have been used with some modification since 1923.

DISPOSAL OF BY-PRODUCT COKE IN 1930

In 1930 the producers of by-product coke reported sales of 14,459,705 tons, of which 2,296,484 tons were furnace coke sold to affiliated corporations, 1,125,503 tons were furnace coke sold to nonaffiliated purchasers (merchant sales), 1,601,266 tons were foundry coke, 1,550,020 tons were coke for other industrial uses, and 7,886,432 tons were coke sold for domestic use. (See Table 41). The quantity not sold but used by the producers themselves was 29,475,600 tons. Of this, 27,991,612 tons were used in blast furnaces and 1,483,988 tons for other purposes. Chief among these other uses were the making of producer gas and water gas—the latter at plants supplying coke-oven gas for city distribution—and the melting of iron in the cupola.

TABLE 41.—*By-product coke produced and sold or used by the producer, by States, in 1930*

[Exclusive of screenings and breeze]

State	Produced		Used by producer in blast furnace, etc.		Sold									
					Furnace [1]		Foundry		Other industrial use (including water gas)		Domestic use		Total	
	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value
Alabama	3, 986, 920	$10, 741, 937	3, 110, 883	$7, 618, 678	3, 700	$8, 345	424, 188	$1, 708, 121	54, 899	$165, 927	337, 943	$1, 032, 578	820, 730	$2, 914, 971
Colorado	379, 070	(2)	399, 677	(2)	----------	----------	1, 056	(2)	10, 781	(2)	658	(2)	12, 495	(2)
Illinois	3, 576, 577	21, 379, 784	2, 110, 318	12, 574, 241	(2)	(2)	(2)	(2)	79, 756	472, 575	813, 271	4, 739, 996	1, 058, 771	6, 433, 767
Indiana	4, 984, 620	12, 166, 488	4, 321, 384	27, 284, 840	----------	----------	164, 197	1, 180, 853	34, 187	190, 740	362, 238	1, 833, 918	560, 622	3, 205, 511
Maryland	1, 169, 016	(2)	1, 069, 818	(2)	----------	----------	----------	----------	94, 275	(2)	1, 590	(2)	95, 865	(2)
Massachusetts	862, 663	6, 697, 235	40, 548	276, 376	(2)	(2)	(2)	(2)	(2)	(2)	450, 513	3, 753, 334	855, 163	6, 679, 347
Michigan	2, 603, 815	14, 222, 856	519, 894	2, 581, 232	(2)	(2)	(2)	(2)	(2)	(2)	1, 653, 112	9, 315, 242	2, 046, 336	11, 433, 894
Minnesota	641, 205	5, 508, 979	256, 716	2, 213, 605	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	365, 151	3, 166, 105
New Jersey	918, 814	(2)	70, 143	(2)	----------	----------	53, 462	(2)	227, 473	(2)	534, 113	(2)	815, 048	(2)
New York	3, 849, 563	24, 657, 090	1, 380, 803	8, 802, 855	878, 336	5, 638, 742	(2)	(2)	(2)	(2)	1, 146, 740	7, 320, 941	2, 406, 387	15, 430, 733
Ohio	6, 163, 324	26, 706, 788	4, 446, 723	19, 263, 043	609, 914	2, 498, 965	119, 116	822, 229	240, 153	1, 062, 527	518, 592	2, 080, 881	1, 487, 775	6, 464, 602
Pennsylvania	12, 529, 255	47, 691, 068	10, 155, 489	36, 586, 566	1, 242, 663	4, 796, 998	67, 416	516, 185	88, 325	631, 520	690, 102	3, 796, 539	2, 088, 506	9, 741, 242
Tennessee	100, 439	445, 949	14, 233	67, 602	----------	----------	19, 133	100, 448	----------	----------	39, 097	153, 425	58, 230	253, 873
Utah	225, 361	(2)	152, 433	(2)	69, 606	(2)	3, 495	(2)	----------	----------	----------	----------	73, 101	(2)
Washington	36, 221	256, 807	24, 313	173, 449	----------	----------	355	2, 485	----------	----------	10, 165	71, 155	10, 520	73, 640
West Virginia	1, 479, 431	3, 587, 317	1, 283, 868	2, 848, 953	(2)	(2)	(2)	(2)	14, 530	39, 179	(2)	(2)	210, 371	766, 924
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	1, 689, 411	11, 584, 309	118, 357	711, 139	87, 776	422, 259	326, 328	2, 438, 056	177, 971	1, 018, 964	902, 559	6, 476, 829	1, 494, 634	10, 356, 108
Undistributed	----------	13, 977, 298	----------	6, 900, 619	529, 992	3, 289, 358	422, 520	3, 748, 667	527, 670	5, 535, 917	425, 739	6, 994, 906	----------	6, 938, 087
Total	45, 195, 705	199, 623, 905	[3]29, 475, 600	[3]127, 903, 198	[1]3, 421, 987	[1]16, 654, 667	1, 601, 266	10, 517, 044	1, 550, 020	9, 117, 349	7, 886, 432	47, 569, 744	14, 459, 705	83, 858, 804
At merchant plants	11, 989, 651	76, 177, 461	1, 535, 556	9, 586, 493	925, 170	5, 362, 127	1, 420, 777	9, 627, 913	1, 334, 215	8, 166, 248	5, 986, 373	38, 599, 985	9, 666, 535	61, 756, 273
At furnace plants	33, 206, 054	123, 446, 444	27, 940, 044	118, 316, 705	2, 496, 817	11, 292, 540	180, 489	889, 131	215, 805	951, 101	1, 900, 059	8, 969, 759	4, 793, 170	22, 102, 531

[1] Includes 2,296,484 tons, valued at $11,077,820, sold to affiliated corporations, and 1,125,503 tons, valued at $5,576,847, reported as merchant sales.

[2] Included under "Undistributed."

[3] Includes 1,483,988 tons, valued at $9,220,983, used for other purposes than in blast furnaces.

DISPOSAL OF BEEHIVE COKE IN 1930

Corresponding data for behive coke are given in Table 42. In 1930 the total sales amounted to 2,614,704 tons, including 391,523 tons of furnace coke sold to affiliated corporations; 1,075,258 tons of "merchant sales" for furnace use; 526,449 tons for foundry use; 480,083 tons for other industrial uses, including manufacture of water gas; and 141,391 tons for domestic use. The quantity of beehive coke used by the producers themselves was 160,186 tons, of which all but 2,886 tons was consumed in iron blast furnaces.

TABLE 42.—*Beehive coke produced and sold or used by the producer, by States, in 1930*

[Exclusive of screenings and breeze]

State	Produced		Used by producer in blast furnace, etc.[1]		Sold									
					Furnace [2]		Foundry		Domestic use		Other industrial use (including water gas)		Total	
	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value
Pennsylvania	2, 011, 324	$6, 407, 168	95, 773	$401, 461	1, 171, 435	$3, 396, 438	344, 295	$1, 464, 174	111, 538	$315, 095	287, 938	$825, 399	1, 915, 206	$6, 001, 106
Washington	12, 252	98, 516	--------	--------	--------	--------	--------	--------	--------	--------	12, 252	98, 516	12, 252	98, 516
West Virginia	421, 730	1, 474, 442	57, 056	246, 499	219, 235	685, 432	113, 198	434, 329	12, 357	35, 561	18, 699	69, 374	363, 489	1, 224, 696
Colorado, Tennessee, Utah, and Virginia	331, 010	1, 533, 231	7, 357	45, 050	76, 111	467, 082	68, 956	306, 344	17, 496	123, 106	161, 194	592, 843	323, 757	1, 489, 375
	2, 776, 316	9, 513, 357	160, 186	693, 010	1, 466, 781	4, 548, 952	526, 449	2, 204, 847	141, 391	473, 762	480, 083	1, 586, 132	2, 614, 704	8, 813, 693

[1] Includes 2,886 tons, valued at $11,506, used for other purposes than in blast furnaces.

[2] Includes 391,523 tons, valued at $1,418,527, sold to affiliated corporations and 1,075,258 tons, valued at $3,130,425, reported as merchant sales.

RELATIVE GROWTH OF FURNACE, FOUNDRY, AND OTHER COKE

The record of the disposal of coke in previous years, as reported by the operators, is brought together in Tables 43 and 44, and in Figures 17 and 18, which indicate the relative growth of sales for furnace, foundry, other industrial, and domestic use. Table 43 shows the sales so classified and the quantity used by the producer for each year from 1918 to 1930. From 1918 to 1922 the operators were merely asked to state the total quantity of furnace, of foundry, and of domestic coke sold. Beginning with 1923, the coke used for "other industrial purposes" was differentiated from domestic coke. From 1923 to 1930 the figures of sales are based upon replies to detailed questions substantially as listed on page 526. The change in form of inquiry affects the comparability of the figures before 1923, but from that year to the present they are entirely comparable. The movement of prices of the several market classes of coke is indicated by the figures of average value per ton at the bottom of Table 43.

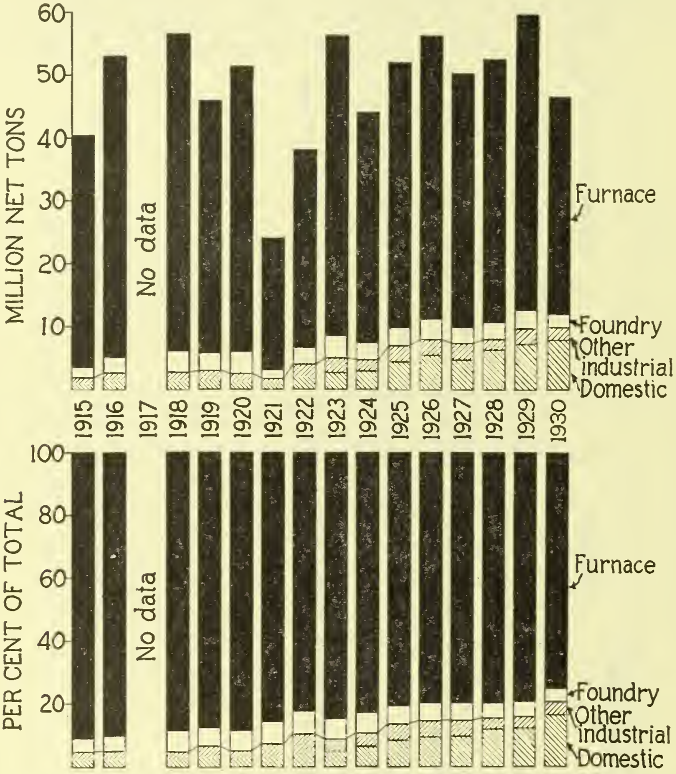

FIGURE. 17.—By-product and beehive coke sold for furnace, foundry, other industrial, and domestic use. Data from Table 44. Figures for furnace coke include all coke used by producer and not sold. The data represent the disposition made of the total production including the exports, except that in 1915 and 1916 the exports are not included

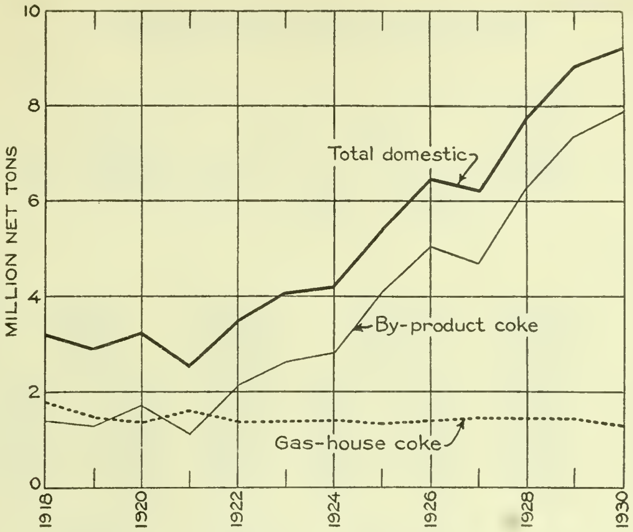

FIGURE 18.—Growth of sales of domestic by-product coke and gas-house coke, 1918-1930

TABLE 43.—*Coke used by producer and sold for furnace, foundry, other industrial, and domestic use, 1918-1930*

[Exclusive of screenings and breeze]

Year	Used by producer in blast furnace or other affiliated works	Sold					
		Furnace		Foundry	Other industrial use (including water gas)	Domestic use	Total sales
		To affiliated corporations	Merchant sales				
Quantity (net tons):							
By-product—							
1918	17,753,348	4,147,695		1,631,052	2,537,059		8,315,806
1919	17,767,066	4,677,497		1,480,516	2,885,270		9,043,283
1920	22,848,461	4,054,964		1,715,982	2,361,737		8,132,683
1921	13,470,396	2,593,318		736,391	1,679,911		5,009,620
1922	21,106,823	2,934,924		1,601,733	3,865,751		8,402,408
1923	27,055,397	2,313,412	1,460,538	1,897,955	1,638,226	2,637,518	9,947,649
1924	24,023,933	2,335,056	1,590,983	1,553,849	1,556,175	2,812,771	9,848,834
1925	28,223,838	2,641,729	1,736,112	1,833,372	2,072,635	4,085,068	12,368,916
1926	31,334,305	2,127,176	1,566,980	2,168,017	1,662,837	5,056,568	12,581,578
1927	30,687,198	2,959,247	967,277	1,938,653	2,022,838	4,702,529	12,590,544
1928	33,938,915	3,136,547	1,652,531	1,955,294	1,318,629	6,254,382	14,317,383
1929	37,041,241	3,470,115	1,351,483	2,114,690	1,693,223	7,376,320	16,005,831
1930	29,475,600	2,296,484	1,125,503	1,601,266	1,550,020	7,886,432	14,459,705
Beehive—							
1918	4,885,318	23,216,627		2,230,156	210,511		25,657,294
1919	3,023,828	14,574,264		1,349,483	143,930		16,067,677
1920	3,204,884	15,188,814		1,807,256	192,142		17,188,212
1921	495,481	3,957,709		1,011,343	56,874		5,025,926
1922	1,071,886	6,105,003		1,164,716	179,670		7,449,389
1923	2,583,507	7,923,783	6,437,771	1,702,764	645,662	95,896	16,805,876
1924	1,574,037	3,582,004	3,357,433	1,363,952	260,046	139,886	8,703,321
1925	2,032,944	3,479,728	3,895,983	1,153,665	572,949	392,698	9,495,023
1926	1,575,039	4,260,028	4,156,032	1,163,660	963,797	386,045	10,929,562
1927	905,359	2,017,616	2,780,433	809,590	569,749	111,103	6,288,491
1928	370,629	808,123	2,045,591	755,312	445,745	78,338	4,133,109
1929	933,395	1,174,374	2,815,114	773,818	641,776	134,703	5,539,785
1930	160,186	391,523	1,075,258	526,449	480,083	141,391	2,614,704

TABLE 43.—*Coke used by producer and sold for furnace, foundry, other industrial, and domestic use, 1918–1930*—Continued

Year	Used by producer in blast furnace or other affiliated works	Sold					
		Furnace		Foundry	Other industrial use (including water gas)	Domestic use	Total sales
		To affiliated corporations	Merchant sales				
Quantity (net tons)—Contd.							
Total—							
1918	22,638,666	27,364,322		3,861,208	2,747,570		33,973,100
1919	20,790,894	19,251,761		2,829,999	3,029,200		25,110,960
1920	26,053,345	19,243,778		3,523,238	2,553,879		25,320,895
1921	13,965,877	6,551,027		1,747,734	1,736,785		10,035,546
1922	22,178,709	9,039,927		2,766,449	4,045,421		15,851,797
1923	29,638,904	10,237,195	7,898,309	3,600,719	2,283,888	2,733,414	26,753,525
1924	25,597,970	5,917,060	4,948,416	2,917,801	1,816,221	2,952,657	18,552,155
1925	30,256,782	6,121,457	5,632,095	2,987,037	2,645,584	4,477,766	21,863,939
1926	32,909,344	6,387,204	5,723,012	3,331,677	2,626,634	5,442,613	23,511,140
1927	31,592,557	4,976,863	3,747,710	2,748,243	2,592,587	4,813,632	18,879,035
1928	34,309,544	3,944,670	3,698,122	2,710,606	1,764,374	6,332,720	18,450,492
1929	37,974,636	4,644,489	4,166,597	2,888,508	2,334,999	7,511,023	21,545,616
1930	29,635,786	2,688,007	2,200,761	2,127,715	2,030,103	8,027,823	17,074,409
Total value:							
By-product—							
1918	(1)	$30,792,247		$15,849,017	$18,907,079		$65,548,343
1919	(1)	31,028,251		12,865,927	15,607,752		59,501,930
1920	(1)	42,841,222		23,678,225	21,080,429		87,599,876
1921	(1)	17,202,994		7,662,781	13,809,165		38,674,940
1922	(1)	20,636,494		15,921,431	34,407,054		70,964,979
1923	$168,379,600	$16,307,054	$9,847,055	19,995,342	$14,845,652	$23,872,007	84,867,110
1924	125,838,387	13,495,287	9,149,521	13,425,334	11,854,698	20,063,417	67,988,257
1925	134,245,288	13,794,422	9,954,964	14,630,450	14,849,829	28,521,425	81,751,090
1926	160,606,129	10,955,119	9,800,299	16,836,376	12,285,212	37,567,659	87,444,665
1927	145,123,216	15,903,197	5,393,276	15,112,967	13,812,393	32,447,939	82,669,772
1928	150,956,628	15,007,542	8,894,711	13,645,407	8,678,854	38,959,815	85,186,329
1929	160,144,042	16,941,539	7,268,653	14,730,679	9,771,396	46,297,848	95,010,115
1930	127,903,198	11,077,820	5,576,847	10,517,044	9,117,349	47,569,744	83,858,804
Beehive—							
1918	(1)	137,782,308		16,802,144	1,319,053		155,903,505
1919	(1)	72,007,820		8,364,256	775,467		81,147,543
1920	(1)	108,943,650		17,209,737	1,545,147		127,698,534
1921	(1)	20,979,386		5,932,599	272,412		27,184,397
1922	(1)	33,724,440		8,334,400	1,086,014		43,144,854
1923	14,045,646	45,756,993	39,326,693	12,259,196	4,112,236	461,971	101,917,089
1924	7,872,356	17,706,496	13,507,138	7,543,143	1,052,249	509,333	40,318,359
1925	9,502,959	16,497,801	15,722,122	5,971,595	2,494,947	2,240,546	42,927,011
1926	7,148,961	20,306,453	16,384,006	5,967,936	4,638,542	2,677,741	49,974,678
1927	4,035,732	9,153,274	10,243,163	4,085,876	2,154,443	446,236	26,082,992
1928	1,658,117	3,099,214	6,699,956	3,306,458	1,715,678	295,904	15,117,210
1929	3,700,962	4,576,983	8,236,242	3,380,845	2,145,176	500,330	18,839,576
1930	693,010	1,418,527	3,130,425	2,204,847	1,586,132	473,762	8,813,693
Total—							
1918	(1)	168,574,555		32,651,161	20,226,132		221,451,848
1919	(1)	103,036,071		21,230,183	16,383,219		140,649,473
1920	(1)	151,784,872		40,887,962	22,625,576		215,298,410
1921	(1)	38,182,380		13,595,380	14,081,577		65,859,337
1922	(1)	54,360,934		24,255,831	35,493,068		114,109,833
1923	182,425,246	62,064,047	49,173,748	32,254,538	18,957,888	24,333,978	186,784,199
1924	133,710,743	31,201,783	22,656,659	20,968,477	12,906,947	20,572,750	108,306,616
1925	143,748,247	30,292,223	25,677,086	20,602,045	17,344,776	30,761,971	124,678,101
1926	167,755,090	31,261,572	26,184,305	22,804,312	16,923,754	40,245,400	137,419,343
1927	149,158,948	25,056,471	15,636,439	19,198,843	15,966,836	32,894,175	108,752,764
1928	152,614,745	18,106,756	15,594,667	16,951,865	10,394,532	39,255,719	100,303,539
1929	163,845,004	21,518,522	15,504,895	18,111,524	11,916,572	46,798,178	113,849,691
1930	128,596,208	12,496,347	8,707,272	12,721,891	10,703,481	48,043,506	92,672,497
Value per ton:							
By-product—							
1918	(1)	$7.42		$9.72	$7.45		$7.88
1919	(1)	6.63		8.69	5.41		6.58
1920	(1)	10.57		13.80	8.93		10.77
1921	(1)	6.63		10.41	8.22		7.72
1922	(1)	7.03		9.94	8.90		8.45
1923	$6.22	$7.05	$6.74	10.54	$9.06	$9.05	8.53
1924	5.24	5.78	5.75	8.64	7.62	7.13	6.90
1925	4.76	5.22	5.73	7.98	7.16	6.98	6.61
1926	5.13	5.15	6.25	7.77	7.39	7.43	6.95
1927	4.73	5.37	5.58	7.80	6.83	6.90	6.57
1928	4.45	4.78	5.38	6.98	6.58	6.23	5.95
1929	4.32	4.88	5.38	6.97	5.77	6.28	5.94
1930	4.34	4.82	4.95	6.57	5.88	6.03	5.80

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[1] No data.

TABLE 43.—*Coke used by producer and sold for furnace, foundry, other industrial, and domestic use, 1918–1930*—Continued

Year	Used by producer in blast furnace or other affiliated works	Sold					
		Furnace		Foundry	Other industrial use (including water gas)	Domestic use	Total sales
		To affiliated corporations	Merchant sales				
Value per ton—Continued.							
Beehive—							
1918	(1)	$5.93		$7.53	$6.27		$6.08
1919	(1)	4.94		6.20	5.39		5.05
1920	(1)	7.17		9.52	8.04		7.43
1921	(1)	5.30		5.87	4.79		5.41
1922	(1)	5.52		7.15	6.04		5.79
1923	$5.44	$5.77	$6.11	7.20	$6.37	$4.82	6.06
1924	5.00	4.94	4.02	5.53	4.05	3.64	4.63
1925	4.67	4.74	4.04	5.18	4.35	5.71	4.52
1926	4.54	4.77	3.94	5.13	4.81	6.94	4.57
1927	4.46	4.54	3.68	5.05	3.78	4.02	4.15
1928	4.47	3.79	3.28	4.38	3.85	3.78	3.66
1929	3.97	3.90	2.93	4.37	3.34	3.71	3.40
1930	4.33	3.62	2.91	4.19	3.30	3.35	3.37
Total—							
1918	(1)	6.16		8.46	7.36		6.52
1919	(1)	5.35		7.50	5.41		5.60
1920	(1)	7.89		11.61	8.86		8.50
1921	(1)	5.83		7.78	8.11		6.56
1922	(1)	6.01		8.77	8.77		7.20
1923	6.15	6.06	6.23	8.96	8.30	8.90	6.98
1924	5.22	5.27	4.58	7.19	7.11	6.97	5.84
1925	4.75	4.95	4.56	6.90	6.56	6.87	5.70
1926	5.10	4.89	4.58	6.84	6.44	7.39	5.84
1927	4.72	5.03	4.17	6.99	6.16	6.83	5.76
1928	4.45	4.59	4.22	6.25	5.89	6.20	5.44
1929	4.31	4.63	3.72	6.27	5.10	6.23	5.28
1930	4.34	4.65	3.96	5.98	5.27	5.98	5.43

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[1] No data.

To trace the relative growth of the several uses, however, the analysis must be carried one step further. Although Table 43 is an accurate summary of the reports made by operating companies it is difficult to interpret because of the large and fluctuating tonnage reported as "used by producer." Table 44 continues the analysis by grouping this tonnage with the sales on the assumption that the total for the two items is the best available barometer of the trend of demand for furnace coke. Actually, the total thus obtained is somewhat in excess of the tonnage charged in iron blast furnaces as previously given in Table 39. In 1930, for example, the total of "sales for furnace use" and "used by producer" was 34,524,554 tons, while the quantity charged in iron blast furnaces was 32,130,070, a difference of 2,394,484 tons. Similar differences between the two sets of figures occur in other years. The excess in the figures in Table 44 is due to three causes: (1) Table 44 covers furnace coke exported to Canada and other countries which, of course, is not included in the record of consumption by American iron furnaces; (2) a considerable part of the sales of furnace coke goes for purposes other than iron making, such, for example, as the smelting of other metals; and (3) the tonnage used by the producer is not all charged in blast furnaces but includes some coke consumed in other ways, either as fuel about the steel works or in other associated enterprises, such as the manufacture of alkalies, city gas, etc. No record of the tonnage used by producers for these other purposes was obtained before 1926, when 429,000 tons of by-product coke and 26,000 tons of beehive coke were so used. The amount is increasing with the growing number of coke plants making city gas.

With these reservations the first column of Table 44 may be used as a rough measure of the trend of demand for furnace coke. In 1915 the demand, calculated in this way and including both beehive and by-product coke, was about 36,703,000 tons and in 1916 about 47,875,000 tons. (Note, however, that the figures for these years do not include the exports.)

In 1918, including the exports, the demand for furnace coke was 50,002,988 tons. In 1929, as already mentioned, the consumption was 46,785,722 tons; and for the period 1918 to 1929, the average annual consumption was 40,616,770, indicating a slight decline from the high level of 1918. In 1930, consumption fell to 34,524,554 tons, reflecting the depressed industrial conditions of that year.

The sales of foundry coke, including beehive and by-product coke and exports, were 3,861,000 tons in 1918; in comparison, the sales of 2,888,508 tons in 1929 show a decrease even in this year of high industrial activity. In 1930 the consumption of foundry coke moved in sympathy with the lowered consumption of furnace coke and fell to 2,127,715 tons. The figures are not to be taken as an exact measure of the trend of consumption of coke by iron foundries because, as already noted, coke of foundry grade is sometimes sold for other uses and because some of the product formerly reported as "foundry coke" may now be reported as "sold for other industrial use." As it stands the record fails to show any consistent increase in the demand for coke in this quarter.

Although the demand for furnace and foundry coke apparently had been decreasing from the 1918 level and declined severely in 1930, the demand for domestic and other industrial coke continued to increase. In 1930, due to the depression, consumption of coke for industrial purposes followed the downward trend of furnace and foundry coke; domestic consumption, however, continued its upward trend and reached a level of 8,027,823 tons.

Beginning with 1923, the miscellaneous industrial sales were reported separately from the sales for domestic purposes, and the growth of the domestic demand can be measured exactly. In 1923, a year when supplies of anthracite were limited, the sales of coke for domestic purposes, including beehive coke, totaled 2,733,000 tons. In 1930 they were 8,027,823 tons. (An approximation of sales of by-product coke for domestic use from 1918 to 1922 is developed in Coke and By-Products in 1922, p. 734. The figures are 1,408,000 in 1918; 1,332,000 in 1919; 1,733,000 in 1920; 1,038,000 in 1921; and 2,139,000 tons in 1922. Although these figures are not strictly comparable with those of later years, the discrepancy is not serious. The trend for the entire period 1918 to 1930 is shown graphically in fig. 18.)

TABLE 44.—*Recapitulation of total supply of coke classified as furnace, foundry, other industrial, and domestic, 1915–1930, in net tons* [1]

[Exclusive of screenings and breeze]

Year	Furnace (including all coke used by producer) [2]	Foundry	Other industrial and domestic			Total sold and used by producer [3]
			Other industrial (not including coke used by producer)	Domestic	Total	
By-product:						
1918	21,901,043	1,631,052	(4)	(4)	2,537,059	26,069,154
1919	22,444,563	1,480,516	(4)	(4)	2,885,270	26,810,349
1920	26,903,425	1,715,982	(4)	(4)	2,361,737	30,981,144
1921	16,063,714	736,391	(4)	(4)	1,679,911	18,480,016
1922	24,041,747	1,601,733	(4)	(4)	3,865,751	29,509,231
1923	30,829,347	1,897,955	1,638,226	2,637,518	4,275,744	37,003,046
1924	27,949,972	1,553,849	1,556,175	2,812,771	4,368,946	33,872,767
1925	32,601,679	1,833,372	2,072,635	4,085,068	6,157,703	40,592,754
1926	35,028,461	2,168,017	1,662,837	5,056,568	6,719,405	43,915,883
1927	34,613,722	1,938,653	2,022,838	4,702,529	6,725,367	43,277,742
1928	38,727,993	1,955,294	1,318,629	6,254,382	7,573,011	48,256,298
1929	41,862,839	2,114,690	1,693,223	7,376,320	9,069,543	53,047,072
1930	32,897,587	1,601,266	1,550,020	7,886,432	9,436,452	43,935,305
Beehive:						
1918	28,101,945	2,230,156	(4)	(4)	210,511	30,542,612
1919	17,598,092	1,349,483	(4)	(4)	143,930	19,091,505
1920	18,393,698	1,807,256	(4)	(4)	192,142	20,393,096
1921	4,453,190	1,011,343	(4)	(4)	56,874	5,521,407
1922	7,176,889	1,164,716	(4)	(4)	179,670	8,521,275
1923	16,945,061	1,702,764	645,662	95,896	741,558	19,389,383
1924	8,513,474	1,363,952	260,046	139,886	399,932	10,277,358
1925	9,408,655	1,153,665	572,949	392,698	965,647	11,527,967
1926	9,991,099	1,163,660	963,797	386,045	1,349,842	12,504,601
1927	5,703,408	809,590	569,749	111,103	680,852	7,193,850
1928	3,224,343	755,312	445,745	78,338	524,083	4,503,738
1929	4,922,883	773,818	641,776	134,703	776,479	6,473,180
1930	1,626,967	526,449	480,083	141,391	621,474	2,774,890
Total:						
1915 [5]	36,702,573	1,664,548	(4)	(4)	1,974,102	40,341,223
1916 [5]	47,875,153	2,680,104	(4)	(4)	2,616,320	53,171,577
1918	50,002,988	3,861,208	(4)	(4)	2,747,570	56,611,766
1919	40,042,655	2,829,999	(4)	(4)	3,029,200	45,901,854
1920	45,297,123	3,523,238	(4)	(4)	2,553,879	51,374,240
1921	20,516,904	1,747,734	(4)	(4)	1,736,785	24,001,423
1922	31,218,636	2,766,449	(4)	(4)	4,045,421	38,030,506
1923	47,774,408	3,600,719	2,283,888	2,733,414	5,017,302	56,392,429
1924	36,463,446	2,917,801	1,816,221	2,952,657	4,768,878	44,150,125
1925	42,010,334	2,987,037	2,645,584	4,477,766	7,123,350	52,120,721
1926	45,019,560	3,331,677	2,626,634	5,442,613	8,069,247	56,420,484
1927	40,317,130	2,748,243	2,592,587	4,813,632	7,406,219	50,471,592
1928	41,952,336	2,710,606	1,764,374	6,332,720	8,097,094	52,760,036
1929	46,785,722	2,888,508	2,334,999	7,511,023	9,846,022	59,520,252
1930	34,524,554	2,127,715	2,030,103	8,027,823	10,057,926	46,710,195

[1] For 1915 and 1916, separate figures for by-product and beehive coke are not available; the total, however, is shown. For 1917 no data on this subject were collected.

[2] Sales of furnace coke plus the total quantity reported "used by producer." Includes coke consumed for other than blast-furnace use. The quantity used for these other purposes in 1930 was 1,483,988 tons of by-product coke and 2,886 tons of beehive coke.

[3] These figures represent the quantity distributed in the year without taking into account changes in producers' stocks and therefore differ slightly from the published totals of production. In 1915 and 1916, moreover, they do not include the quantity exported.

[4] "Other industrial" and "domestic" were not reported separately prior to 1923.

[5] Figures for 1915 and 1916 do not include exports and hence are not strictly comparable with other years

DOMESTIC COKE

The use of coke for domestic fuel purposes increased in 1930 in contrast with curtailed consumption in metallurgical and other industries. By-product and beehive coke ovens disposed of 8,027,823 tons in the domestic market, an increase of 516,800 tons over 1929. While this quantity is only a small percentage of the total domestic fuel requirements of the nation—probably about 5 per cent—it exerts a considerable competitive effect on the domestic fuel market in localities where its distribution is largest. (See fig. 18.)

Coke enters the domestic fuel market mainly under two conditions: (1) In or near areas of surplus metallurgical coke production and (2) in localities where the manufacture and distribution of large quantities of city gas results in the production of correspondingly large quantities of coke. Since this fuel is, on the average, not transported as far as coal, its consumption for domestic purposes tends to be localized in regions near the centers of production.

A survey of domestic coke distribution by States[7] indicates that about 90 per cent of the coke used for domestic fuel is consumed in the eastern North Central States and Minnesota, the Middle Atlantic States, and New England, while the remainder is widely distributed in about 30 other States. Coke consumption in the eastern North Central States and Minnesota represents the surplus output of ovens in Illinois, Indiana, Michigan, Ohio, Tennessee, and Wisconsin, with smaller contributions from ovens in other States. The coke producers in these States are concerned mainly with supplying blast furnaces and industrial users, but they are also finding the growing domestic market a profitable outlet.

In the Middle Atlantic and New England States the supply of coke is obtained to a considerable extent from local by-product ovens whose main business is to manufacture and deliver gas to city gas utility systems. In this case, coke is a by-product and must seek whatever outlets are available for this type of solid fuel. By aggressive merchandizing practices, the producers of coke have expanded their sales to domestic users in these States, in spite of the strongly entrenched position of anthracite and the rising trend of domestic fuel-oil consumption.

The rapid increase in the use of coke for house fuel when the demand for metallurgical coke shows no consistent growth is reflected in widespread interest in the possibilities of the domestic market.

It is seldom realized that in the aggregate the consumption of fuel for heating buildings is the largest single item in the national demand for energy, exceeding even the requirements of the railroads. The total consumption of fuel for domestic purposes, from the latest calculations available, is equivalent to 163,000,000 tons of coal a year, of which 27,000,000 tons is the equivalent of liquid or gas and 136,000,000 tons is solid fuels. This figure includes fuel for heating large buildings other than factories. The elements making up the total were shown graphically in Figure 47 of Coke and By-Products in 1928.

As a consumer the householder is naturally conservative, and in the past domestic fuel demand has been slow to change, but the tendency toward mechanization and the interplay of competition have appeared in the field of domestic heating. The domestic market now shows three distinct tendencies: An increasing proportion of the population is living and working in large buildings that can readily be heated by central heating installations; there is an increasing demand for fuels that will not smoke; and, perhaps most important, the consumer is beginning to appreciate the luxury of automatic heating with oil, gas, and small automatic stokers adapted to solid fuels. Special data on the domestic fuel market will be found in Coke and By-Products in 1928, pages 753–760, and in Anthracite in 1930.

The competitive nature of the domestic market is indicated by the figures in Table 45 which show the supplies of the several fuels available for or actually used for domestic purposes in the last six years.

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[7] Distribution of By-Product and Beehive Coke, and Fuel Briquets. Supplement to Monthly Coal Distribution Report No. 2, Bureau of Mines, Sept. 21, 1931.

TABLE 45.—*Total supplies of fuels used for domestic purposes in the United States, 1924–1930*

[The figures for 1925 and 1926 were affected by the great strike of the anthracite miners which lasted from Sept. 1, 1925, to Feb. 18, 1926]

	1924	1925	1926	1927	1928	1929	1930
Solid fuels (net tons)							
Pennsylvania anthracite production:							
Shipments of domestic sizes	56, 576, 296	38, 305, 222	54, 096, 437	48, 999, 058	46, 218, 403	46, 141, 575	42, 508, 088
Shipments of buckwheat No. 1 [1]	9, 510, 508	6, 631, 604	8, 581, 966	9, 062, 977	8, 769, 923	8, 597, 053	8, 570, 032
Shipments of smaller steam sizes	11, 160, 695	8, 831, 546	12, 640, 417	12, 433, 251	11, 499, 274	10, 555, 951	10, 123, 937
Local sales	3, 043, 939	2, 884, 577	2, 687, 411	3, 046, 770	3, 184, 825	3, 233, 023	3, 144, 434
Total commercial production	80, 291, 438	56, 652, 949	78, 006, 231	73, 542, 056	69, 672, 425	68, 527, 602	64, 346, 491
Anthracite exported	4, 017, 785	3, 179, 006	4, 029, 683	3, 325, 507	3, 336, 272	3, 406, 369	2, 551, 659
Anthracite imported, chiefly from United Kingdom	117, 951	382, 894	813, 956	119, 030	384, 707	487, 172	674, 812
Fuel briquets produced	580, 470	839, 370	995, 332	970, 468	947, 423	1, 212, 415	1, 028, 865
Fuel briquets imported	38	6, 758	123, 593	60, 601	71, 485	89, 458	73, 418
By-product coke sold for domestic use	2, 812, 771	4, 085, 068	5, 056, 568	4, 702, 529	6, 254, 382	7, 376, 320	7, 886, 432
Beehive coke sold for domestic use	139, 886	392, 698	386, 045	111, 103	78, 338	134, 703	141, 391
Coke imported	82, 833	201, 579	284, 548	168, 859	147, 701	119, 724	132, 674
Gas-house coke sold	[2] 1, 400, 000	1, 368, 704	[2] 1, 400, 000	1, 484, 268	[2] 1, 450, 000	1, 400, 000	[2] 1, 300, 000
Petroleum coke produced [3]	761, 100	991, 000	995, 300	1, 145, 200	1, 426, 600	1, 820, 600	1, 940, 000
Anthracite and semianthracite produced outside of Pennsylvania	704, 513	786, 594	843, 125	651, 869	712, 406	842, 313	708, 221
Bituminous coal for domestic use [4]	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Oil (barrels) [6]							
Oil used for heating houses	[7] 5, 021, 000	[7] 8, 829, 000	9, 080, 000	11, 709, 000	[7] 14, 271, 000	[7] 19, 581, 000	25, 359, 000
Oil used for heating offices, hotels, apartments, schools, hospitals, and buildings other than houses	(8)	[2] 12, 100, 000	13, 874, 000	15, 751, 000	16, 427, 000	[7] 17, 820, 000	17, 344, 000
Gas (million cubic feet)							
Natural gas consumed for domestic use	285, 152	272, 146	289, 175	296, 036	320, 877	359, 853	376, 407
Manufactured gas sold for domestic purposes	(8)	(8)	(8)	[9] 281, 044	(8)	[9] 285, 552	(8)

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[1] A considerable part of the buckwheat No. 1 is used for domestic purposes.

[2] Partly estimated.

[3] How much petroleum coke was used for house fuel prior to 1928 is not known. For that year 235,000 tons were reported to have been consumed for domestic heating, according to E. B. Swanson in Economic Paper 9, Bureau of Mines.

[4] During the anthracite strike of 1925–26 about 17,000,000 tons of bituminous coal in addition to the normal consumption were used to replace anthracite.

[5] Between 56,000,000 and 77,000,000 tons a year.

[6] Based on surveys by E. B. Swanson, U. S. Bureau of Mines.

[7] Revised.

[8] Data not available.

[9] From Census of Manufactures.

Active competition between the several fuels is forcing down prices. Prices of anthracite, bituminous coal, briquets, and fuel oil are falling.

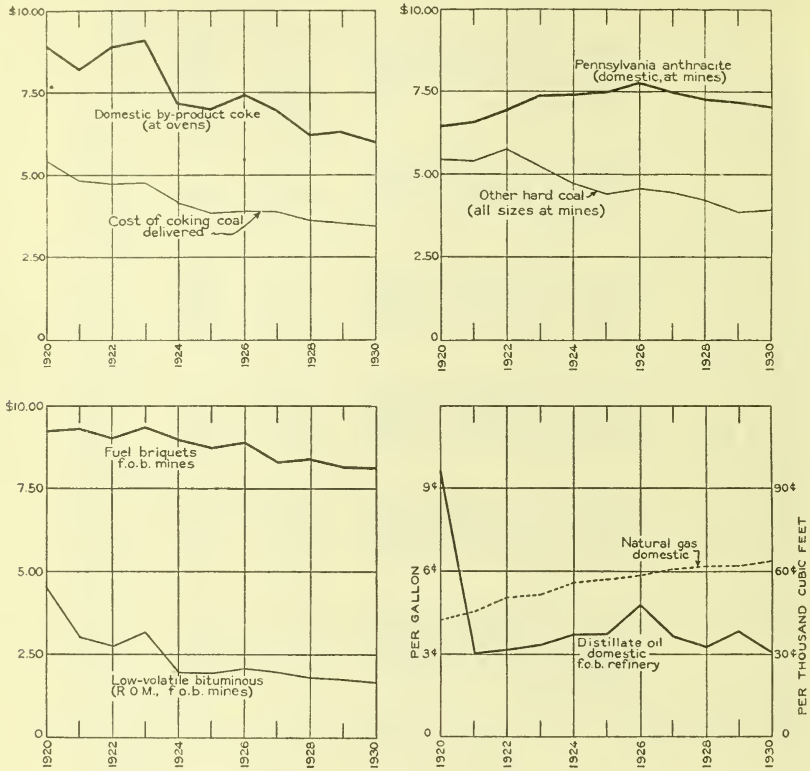

FIGURE 19.—Price trends of domestic fuels, 1920–1930. As the figures are not retail prices they do not show comparative costs to the consumer, but they do indicate the general movement of prices. Prices of solid fuel are all per net ton including anthracite. For data, see Table 46

The average sales realization on domestic by-product coke has declined from $7.13 in 1924 to $6.03 in 1930. Details are given in Table 46 and Figure 19.

TABLE 46.—*Price trends of domestic by-product coke and of other fuels suitable for household use, 1923–1930*

	Unit	Average price per unit							
		1923	1924	1925	1926	1927	1928	1929	1930
By-product coke, f. o. b. ovens:									
Sales for domestic and miscellaneous industrial use.[1]	Net ton	$9.06	$7.31	$7.04	$7.42	$6.88	$6.29	$6.18	$6.01
Sales for domestic use	do	9.05	7.13	6.98	7.43	6.90	6.23	6.28	6.03
Domestic anthracite, f. o. b. mines Pennsylvania, average realization on breaker shipment.[2]	Gross ton.	8.23	8.25	8.30	8.66	8.33	8.09	8.00	7.90
Fuel briquets, Central States, f. o. b. plants.	Net ton	9.35	9.00	8.72	8.86	8.30	8.38	8.13	8.13
Cost of coking coal delivered at by-product plants.	do	4.76	4.13	3.86	3.88	3.87	3.57	3.50	3.48
Low-volatile bituminous coal, f. o. b. mines.[3]	do	3.16	1.96	1.90	2.04	1.93	1.75	1.73	1.71
Hard coal produced outside Pennsylvania, f. o. b. mines.[4]	do	5.34	4.70	4.41	4.57	4.46	4.19	3.84	3.89
Oil, distillate for domestic heating, f. o. b. refinery.[5]	Gallon	.033	.037	.037	.048	.036	.032	.038	.031
Natural gas, domestic use, at point of consumption.	M cu. ft.	.514	.540	.560	.584	.608	.620	.620	.635

[1] Until 1923 the sales for miscellaneous industrial use (a small item) were combined with those for domestic use.
[2] Includes pea and all larger sizes.
[3] Average (unweighted) of the average sales realization of operators in McDowell, Mercer, and Raleigh Counties, W. Va.
[4] Includes anthracite and semianthracite from Colorado, New Mexico, Arkansas, and Virginia.
[5] 38–40 straw distillate, Oklahoma—from Nat. Petrol. News.

Besides coke from by-product ovens the domestic fuel market is also supplied by the product of gas-house ovens and small quantities of petroleum coke. Table 47 summarizes the supply of domestic coke from all sources.

TABLE 47.—*Coke sold for domestic use classified by type of producing interest, 1929 and 1930*

Type of producing interest	Net tons sold		Average value at plant	
	1929	1930	1929	1930
Beehive oven coke	134,703	141,391	$3.71	$3.35
By-product oven coke:				
Plants affiliated with iron furnaces	1,678,137	1,900,059	5.02	4.72
Plants engaged largely in supplying gas for city distribution, frequently public utilities	3,307,341	3,397,787	7.20	6.79
Other merchant plants	2,390,842	2,588,586	5.88	5.76
Total by-product coke	7,376,320	7,886,432	6.28	6.03
Gas-house coke, including all types of carbonizing equipment other than by-product coke ovens [1]	1,400,000	[2] 1,300,000	(3)	(3)
Petroleum coke	(4)	(4)	(4)	(4)

[1] Includes sales for all purposes, most of which were doubtless domestic.
[2] Partly estimated.
[3] No data.
[4] In a special study on "Petroleum Coke," E. B. Swanson of the Bureau of Mines reported a consumption of 235,000 tons of petroleum coke for domestic purposes in 1928. Figures for later years have not been collected.

THE RETAIL DEALER AS A DISTRIBUTOR OF COKE

The policy of coke producers with respect to retailing differs widely. Some companies have found it necessary to develop their own retail departments; others have successfully utilized established retailers. So fortunate has this policy been in some localities that individual retailers report as much as 60 per cent of their total sales as coke. For the country as a whole, however, coke still forms a small part of the business of the typical retail coal merchant. Table 48, compiled by H. O. Rogers from reports of representative retailers, shows that for the country as a whole 60.6 per cent of the total tonnage passing through dealers' yards consisted of bituminous coal, 36.1 per cent was anthracite, and only 3.3 was coke. The proportion of coke in the total varied widely in different parts of the country. It was highest in the Upper Mississippi Valley, particularly in the Lake States.

TABLE 48.—*Relative proportions of coke, anthracite, and bituminous coal in the deliveries made by 875 representative dealers*

[The figures cover a selected list of retailers who handle about 20 per cent of the total retail trade. They cover four periods of two months each; namely, February–March, May–June, August–September, November–December, 1930. Figures for coke include retort coke and possibly some beehive-oven coke]

	Total of four stock surveys (net tons delivered to consumers)				Per cent of total		
	Bituminous	Anthracite	Coke	Total	Bituminous	Anthracite	Coke
1. New England	2,130,320	1,600,045	80,420	3,810,785	55.9	42.0	2.1
Maine	190,612	117,189	7,529	315,330	60.4	37.2	2.4
New Hampshire	91,487	42,522	3,631	137,640	66.5	30.9	2.6
Vermont	21,787	51,322	1,407	74,516	29.2	68.9	1.9
Massachusetts	1,216,735	991,998	54,716	2,263,449	53.8	43.8	2.4
Rhode Island	386,624	128,548	7,681	522,853	73.9	24.6	1.5
Connecticut	223,075	268,466	5,456	496,997	44.9	54.0	1.1
2. Middle Atlantic	1,849,943	4,869,619	178,606	6,898,168	26.8	70.6	2.6
New York	547,159	3,773,781	143,046	4,463,986	12.3	84.5	3.2
New Jersey	44,789	360,951	4,230	409,970	10.9	88.1	1.0
Eastern Pennsylvania	94,264	503,861	4,066	602,191	15.6	83.7	.7
Western Pennsylvania	663,397	13,500	24,701	701,598	94.6	1.9	3.5
Delaware	13,595	33,896	1,446	48,937	27.8	69.3	2.9
Maryland	121,704	78,451	625	200,780	60.6	39.1	.3
District of Columbia	365,035	105,179	492	470,706	77.6	22.3	.1
3. Ohio	755,490	14,080	24,645	794,215	95.1	1.8	3.1
4. Southern Michigan	631,036	76,638	107,551	815,225	77.4	9.4	13.2
5. Illinois and Indiana	3,046,842	183,360	124,264	3,354,466	90.8	5.5	3.7
Illinois	2,630,220	178,775	105,914	2,914,909	90.2	6.2	3.6
Indiana	416,622	4,585	18,350	439,557	94.8	1.0	4.2
6. Lower Missouri Valley	788,166	18,726	28,144	835,036	94.4	2.2	3.4
Missouri	381,564	6,748	17,653	405,965	94.0	1.7	4.3
Iowa	338,303	9,985	8,036	356,324	94.9	2.8	2.3
Nebraska	61,122	1,469	2,455	65,046	94.0	2.3	3.7
Kansas	7,177	524		7,701	93.2	6.8	
7. Lake Dock Territory	694,743	92,315	79,749	866,807	80.1	10.7	9.2
Wisconsin	319,321	51,718	34,709	405,748	78.7	12.7	8.6
Northern Michigan	47,814	4,186	3,370	55,370	86.3	7.6	6.1
Minnesota	271,379	33,703	40,589	345,671	78.5	9.8	11.7
North Dakota	21,825	876	766	23,467	93.0	3.7	3.3
South Dakota	34,404	1,832	315	36,551	94.1	5.0	.9

TABLE 48.—*Relative proportions of coke, anthracite, and bituminous coal in the deliveries made by 875 representative dealers*—Continued

	Total of four stock surveys (net tons delivered to consumers)				Per cent of total		
	Bituminous	Anthracite	Coke	Total	Bituminous	Anthracite	Coke
8. Southeast	1,110,300	29,696	8,310	1,148,306	96.7	2.6	0.7
West Virginia	24,188	258	42	24,488	98.8	1.0	.2
Virginia	133,788	22,991	827	157,606	84.9	14.6	.5
North Carolina	46,357	2,599	210	49,166	94.3	5.3	.4
South Carolina	36,135	218	654	37,007	97.6	.6	1.8
Georgia	269,667	225	499	270,391	99.7	.1	.2
Florida	6,770	2,368	393	9,531	71.0	24.9	4.1
Kentucky	299,009	509	1,116	300,634	99.4	.2	.4
Tennessee	206,560	200	3,319	210,079	98.3	.1	1.6
Alabama	63,687	316	1,211	65,214	97.7	.5	1.8
Mississippi	24,139	12	39	24,190	99.8	(1)	.2
9. Southwest, Mountain, and Pacific	591,099	17,787	4,485	613,371	96.4	2.9	.7
Louisiana	107,403	645	799	108,847	98.7	.6	.7
Arkansas	4,195	632	43	4,870	86.1	13.0	.9
Oklahoma	3,219	31		3,250	99.0	1.0	
Texas	4,153	128		4,281	97.0	3.0	
New Mexico	48,618	10,848		59,466	81.8	18.2	
Arizona	6,552	658		7,210	90.9	9.1	
Colorado	143,508	3,421	1,153	148,082	96.9	2.3	.8
Utah	44,031		1,897	45,928	95.9		4.1
Nevada	4,178		29	4,207	99.3		.7
Wyoming	3,958			3,958	100.0		
Montana	36,316			36,316	100.0		
Idaho	60,287	143		60,430	99.8	.2	
Washington	76,164	282	86	76,532	99.5	.4	.1
Oregon	22,406		201	22,607	99.1		.9
California	26,111	999	277	27,387	95.3	3.7	1.0
Total United States	11,597,939	6,902,266	636,174	19,136,379	60.6	36.1	3.3

[1] Less than one-tenth of 1 per cent.

STOCKS OF COKE

With the growth of the domestic trade the problem of storing the coke at the producers' plants becomes increasingly important, especially during the spring and summer. Table 49 gives details of the total quantity of coke and breeze on hand at all coke plants on January 1, 1931. On that date the by-product plants reported a total of 1,337,762 tons of furnace and foundry coke and 1,916,526 tons of domestic coke. Table 50 gives comparative figures of the total on hand as far back as 1925. The stocks of coke on hand at producers' plants, by months during 1929 and 1930, are given in Table 51. (See also fig. 20.) As might be expected, the furnace plants carry relatively steady stocks and the stocks of merchant plants fluctuate sharply with the season. In comparing present stocks with those in the past one must remember that stocks tend to increase with the natural growth of the industry. Each new by-product plant adds its quota to the quantity of coke on hand. This element of growth is eliminated in Table 52, which shows the stocks at a group of 21 identical plants that have reported at intervals since January 1, 1922.

TABLE 49.—*Stocks of furnace, foundry, and domestic coke, and of breeze on January 1, 1931, by States, in net tons*

[Based on complete reports from all producers]

State	Furnace	Foundry	Domestic and other	Total coke	Breeze
By-product plants:					
Alabama	427, 597	184, 321	77, 227	689, 145	65, 343
Colorado	3, 027	244	----------	3, 271	70
Illinois	65, 859	34, 532	456, 566	556, 957	94, 536
Indiana	52, 637	522	123, 893	177, 052	15, 407
Maryland	10, 793	17	----------	10, 810	22, 597
Massachusetts	(1)	(1)	[1] 62, 790	62, 790	27, 317
Michigan	695	1, 288	141, 678	143, 661	3, 689
Minnesota	5, 414	----------	119, 876	125, 290	12, 532
New Jersey	----------	----------	122, 426	122, 426	12, 470
New York	[2] 29, 563	(2)	196, 522	226, 085	18, 562
Ohio	225, 048	3, 408	169, 419	397, 875	52, 711
Pennsylvania	233, 349	5, 961	184, 425	423, 735	42, 916
Tennessee	25, 741	300	1, 435	27, 476	7, 343
Utah	3, 884	----------	8, 498	12, 382	47, 668
Washington	----------	----------	4, 907	4, 907	----------
West Virginia	22, 695	173	9, 852	32, 720	16, 252
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	[2] 694	(2)	237, 012	237, 706	21, 158
	[1,2] 1, 106, 996	[1,2] 230, 766	[1] 1, 916, 526	3, 254, 288	460, 571
At merchant plants	66, 186	51, 852	1, 681, 300	1, 799, 338	188, 751
At furnace plants	1, 040, 516	179, 680	234, 754	1, 454, 950	271, 820
Beehive plants:					
Colorado	1, 171	----------	----------	1, 171	----------
Pennsylvania	25, 978	5, 152	2, 844	33, 974	93, 195
Tennessee	----------	----------	3, 000	3, 000	----------
Utah	----------	255	----------	255	----------
Virginia	2, 641	----------	----------	2, 641	20
West Virginia	1, 901	654	----------	2, 555	----------
	31, 691	6, 061	5, 844	43, 596	93, 215

[1] A small amount of furnace and foundry coke is included with domestic.

[2] A small amount of foundry coke is included with furnace.

TABLE 50.—*Summary of total stocks of coke on hand at all by-product and beehive plants at the first of the year, 1925–1931*

	Jan. 1, 1925	Jan. 1, 1926	Jan. 1, 1927	Jan. 1, 1928	Jan. 1, 1929	Jan. 1, 1930	Jan. 1, 1931
By-product plants:							
Furnace	555, 080	367, 691	532, 831	627, 869	750, 318	931, 654	1, 106, 996
Foundry	50, 794	22, 953	37, 414	29, 371	24, 426	26, 943	230, 766
Domestic and other	880, 386	263, 923	697, 135	1, 156, 991	1, 018, 205	1, 256, 612	1, 916, 526
Total	1, 486, 260	654, 567	1, 267, 380	1, 814, 231	1, 792, 949	2, 215, 209	3, 254, 288
Beehive plants:							
Furnace	59, 017	37, 435	25, 425	54, 441	38, 446	30, 131	31, 691
Foundry	12, 507	6, 938	6, 890	13, 615	8, 020	7, 929	6, 061
Domestic and other	2, 897	7, 180	6, 446	4, 147	8, 511	7, 656	5, 844
Total	74, 421	51, 553	38, 761	72, 203	54, 977	45, 716	43, 596
Total:							
Furnace	614, 097	405, 126	558, 256	682, 310	788, 764	961, 785	1, 138, 687
Foundry	63, 301	29, 891	44, 304	42, 986	32, 446	34, 872	236, 827
Domestic and other	883, 283	271, 103	703, 581	1, 161, 138	1, 026, 716	1, 264, 268	1, 922, 370
Total	1, 560, 681	706, 120	1, 306, 141	1, 886, 434	1, 847, 926	2, 260, 925	3, 297, 884

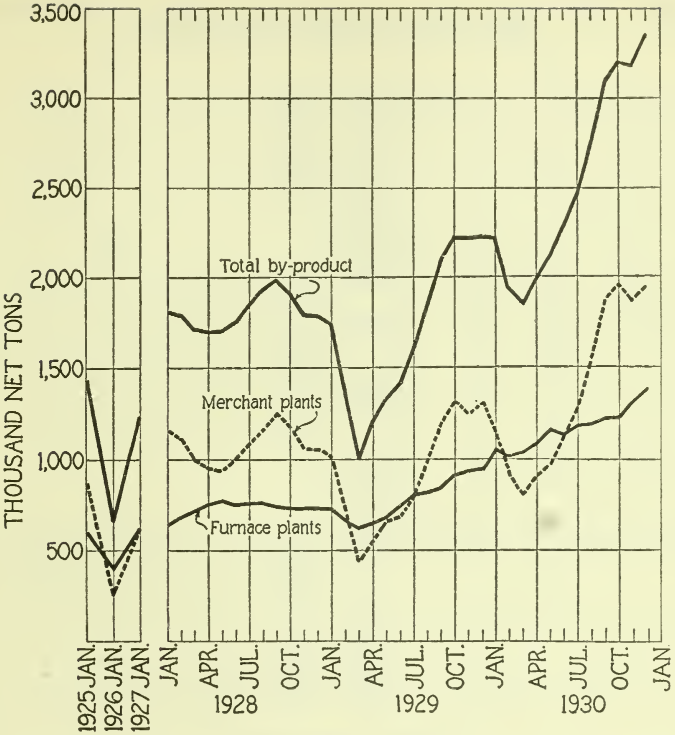

FIGURE 20.—Total stocks of by-product coke at producers' plants on the first of each month. The figures in this diagram include all by-product plants and are therefore more complete than those for the selected group of 21 identical plants whose stocks from 1922 to 1930 are shown in Figure 2

TABLE 51.—*Total stocks of coke on hand at all furnace and nonfurnace by-product plants on the first of each month, 1929 and 1930*

[Includes furnace, foundry, and domestic, but not breeze]

Date	Furnace plants		Other plants		Total	
	1929	1930	1929	1930	1929	1930
January 1	768, 554	1, 070, 114	1, 024, 395	1, 145. 095	1, 792, 949	2, 215, 209
February 1	633, 845	1, 029, 043	734, 411	905, 396	1, 368, 256	1, 934, 439
March 1	597, 601	1, 031, 059	459, 858	812, 295	1, 057, 459	1, 843, 354
April 1	636, 517	1, 087, 305	576, 045	905, 468	1, 212, 562	1, 992, 773
May 1	660, 881	1, 155, 233	678, 490	964, 417	1, 339, 371	2, 119, 650
June 1	723, 811	1, 144, 859	703, 777	1, 135, 683	1, 427, 588	2, 280. 542
July 1	780, 928	1, 180, 079	833, 035	1, 286, 744	1, 613, 963	2, 466, 823
August 1	779, 617	1, 194, 057	1, 069, 303	1. 546, 952	1, 848, 920	2, 741, 009
September 1	846, 769	1, 226, 496	1, 253, 349	1, 865, 501	2, 100, 118	3, 091, 997
October 1	915, 080	1, 232, 194	1, 314, 566	1, 955, 414	2, 229, 646	3, 187, 608
November 1	940, 963	1, 311, 437	1, 260, 054	1, 862, 835	2, 201, 017	3, 174, 272
December 1	954, 718	1, 387, 255	1, 314, 079	1, 944, 656	2, 268, 797	3, 331, 911

TABLE 52.—*Total stocks of coke at 21 identical by-product coke plants supplying gas for city use, 1922–1930, in net tons*

Date	Net tons
1922	
Jan. 1	1,017,000
Mar. 1	987,000
Oct. 1	250,000
Nov. 1	228,000
1923	
Jan. 1	212,000
Feb. 1	146,000
Mar. 1	92,000
June 1	202,000
July 1	308,000
Aug. 1	430,000
Sept. 1	501,000
Oct. 1	476,000
1924	
Jan. 1	772,000
Sept. 1	1,114,000
1925	
Mar. 1	631,000
June 1	722,000
Sept. 1	865,000
Nov. 1	623,000
1926	
Jan. 1	248,000
Feb. 1	90,000
Apr. 1	53,000
May 1	151,000
July 1	334,000
Aug. 1	470,000
Oct. 1	628,000
Nov. 1	579,000
1927	
Jan. 1	516,000
Feb. 1	353,000
Apr. 1	470,000
May 1	560,000
July 1	584,000
Aug. 1	705,000
Oct. 1	799,000
1928	
Jan. 1	787,000
Feb. 1	749,000
Apr. 1	750,000
May 1	787,000
July 1	879,000
Aug. 1	952,000
Oct. 1	959,000
Nov. 1	806,000
1929	
Jan. 1	883,000
Feb. 1	623,000
Mar. 1	383,000
Apr. 1	480,000
May 1	537,000
June 1	530,000
July 1	600,000
Aug. 1	703,000
Sept. 1	810,000
Oct. 1	801,000
Nov. 1	776,000
Dec. 1	826,000
1930	
Jan. 1	749,000
Feb. 1	596,000
Mar. 1	586,000
Apr. 1	668,000
May 1	687,000
June 1	778,000
July 1	851,000
Aug. 1	1,016,000
Sept. 1	1,172,000
Oct. 1	1,298,000
Nov. 1	1,262,000
Dec. 1	1,327,000
Dec. 31	1,246,000

VALUE AND PRICE

Tables 53–57 show the average values obtained for by-product and beehive coke over a series of years, as well as prices obtained per month in various markets of the United States. Figures 21 and 22 show graphically the trend of coke prices in recent years.

TABLE 53.—*Average receipts per net ton for coke sold, by States, in 1930*

State	By-product				Beehive			
	Furnace	Foundry	Other industrial, etc.	Domestic	Furnace	Foundry	Other industrial, etc.	Domestic
Alabama	$2.26	$4.03	$3.02	$3.06				
Illinois	(1)	(1)	5.93	5.83				
Indiana		7.19	5.58	5.06				
Massachusetts	(1)	(1)	(1)	8.33				
Michigan	(1)	(1)	(1)	5.63				
New York	6.42	(1)	(1)	6.38				
Ohio	4.10	6.90	4.42	4.01				
Pennsylvania	3.86	7.66	7.15	5.50	$2.90	$4.25	$2.87	$2.82
Tennessee		5.25		3.92	(1)	3.84	2.63	
Virginia					(1)	4.14	3.76	
Washington		7.00		7.00			8.04	
West Virginia	(1)	(1)	2.70	(1)	3.13	3.84	3.71	2.88
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	4.81	7.47	5.73	7.18				
Undistributed [2]	5.49	7.80	6.44	7.27	6.14			
	4.87	6.57	5.88	6.03	3.10	4.19	3.30	3.35

[1] Included under "Undistributed."

[2] Includes, in addition to items indicated by footnote 1, Colorado, Maryland, Minnesota, New Jersey, and Utah.

TABLE 54.—*Average value per ton of all coke produced, 1913–1930, and average receipts per ton for coke sold, 1918–1930*

Year	Value per ton produced [1]			Receipts per ton sold		
	By-product	Beehive	Total	By-product	Beehive	Total
1913	$3.83	$2.39	$2.78	(2)	(2)	(2)
1914	3.39	2.15	2.56	(2)	(2)	(2)
1915	3.45	2.07	2.54	(2)	(2)	(2)
1916	3.95	2.69	3.13	(2)	(2)	(2)
1917	6.18	4.81	5.36	(2)	(2)	(2)
1918	7.42	6.21	6.77	$7.88	$6.08	$6.52
1919	6.37	5.15	5.85	6.58	5.05	5.60
1920	10.15	7.94	9.27	10.77	7.43	8.50
1921	5.95	5.45	5.84	7.72	5.41	6.56
1922	6.59	5.84	6.42	8.45	5.79	7.20
1923	6.85	5.98	6.56	8.53	6.06	6.98
1924	5.76	4.70	5.51	6.90	4.63	5.84
1925	5.28	4.56	5.12	6.61	4.52	5.70
1926	5.65	4.57	5.41	6.95	4.57	5.84
1927	5.29	4.20	5.13	6.57	4.15	5.76
1928	4.90	3.63	4.79	5.95	3.66	5.44
1929	4.80	3.49	4.66	5.94	3.40	5.28
1930	4.42	3.43	4.36	5.80	3.37	5.43

[1] Includes operators' statements of the value of coke consumed by them in associated enterprises but not sold, except that in 1918 and 1920 the value of such coke was estimated for each State at the average value for that State of the part of the product reported sold.

[2] Data not available.

TABLE 55.—*Average value per net ton of coke exported from the United States, 1900–1930*

[Computed from records of Bureau of Foreign and Domestic Commerce]

Year	Average value	Year	Average value	Year	Average value
1900	$3.22	1911	$3.14	1922	$8.44
1901	3.63	1912	3.29	1923	9.61
1902	4.06	1913	3.35	1924	7.47
1903	4.49	1914	3.37	1925	7.20
1904	3.94	1915	3.45	1926	7.07
1905	3.34	1916	3.58	1927	6.73
1906	3.21	1917	6.06	1928	6.74
1907	3.27	1918	7.03	1929	6.33
1908	3.11	1919	7.15	1930	6.04
1909	3.22	1920	10.87		
1910	3.10	1921	9.00		

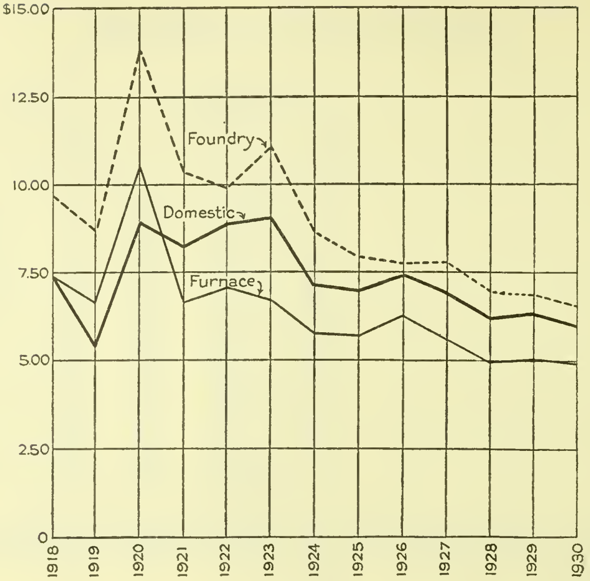

FIGURE 21.—Downward trend of coke prices. Average sales realization on sales of by-product coke for furnace, foundry, and domestic use. Note that prior to 1923 the average for domestic coke includes also sales for miscellaneous industrial use

TABLE 56.—*Average monthly prices per net ton at ovens of spot or prompt Connellsville furnace and foundry coke, 1920–1930* [1]

Month	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
FURNACE											
January	$6.00	$5.06	$2.75	$8.05	$3.94	$3.94	$7.19	$3.50	$2.70	$2.75	$2.55
February	6.00	4.50	3.04	7.13	4.08	3.63	7.31	3.38	2.68	2.90	2.60
March	6.00	4.35	3.25	7.25	4.08	3.35	3.05	3.35	2.60	2.98	2.60
April	9.60	3.50	4.48	6.31	3.75	3.04	3.00	3.20	2.60	2.78	2.60
May	12.00	3.25	6.00	5.15	3.25	3.00	2.91	2.94	2.60	2.75	2.53
June	15.00	3.00	6.75	4.75	3.19	2.77	2.83	2.93	2.60	2.75	2.50
July	17.20	2.81	10.75	4.55	3.00	2.83	2.84	3.00	2.63	2.75	2.50
August	17.75	2.75	12.80	4.56	3.00	3.06	2.95	3.00	2.75	2.73	2.58
September	16.70	3.15	11.13	4.50	3.00	3.49	3.38	2.85	2.75	2.65	2.60
October	15.12	3.28	9.60	3.85	3.00	6.13	3.63	2.85	2.83	2.65	2.60
November	8.26	3.03	7.19	3.81	3.04	5.75	4.43	2.77	2.75	2.65	2.53
December	6.20	2.75	7.00	4.00	3.68	4.32	3.50	2.75	2.75	2.64	2.50
Average	11.32	3.45	7.06	5.33	3.42	3.78	3.92	3.04	2.69	2.75	2.56
FOUNDRY											
January	7.00	6.38	3.75	8.70	4.75	4.88	7.75	4.50	3.75	3.75	3.50
February	7.00	5.63	4.00	8.25	4.88	4.31	8.31	4.31	3.75	3.75	3.50
March	7.00	5.45	4.25	8.38	4.88	4.15	4.40	4.40	3.75	3.75	3.50
April	10.20	4.75	5.06	7.56	4.75	4.00	4.06	4.06	3.75	3.75	3.50
May	13.00	4.50	6.30	6.15	4.69	4.00	4.00	4.00	3.75	3.75	3.50
June	15.75	4.45	7.25	5.56	4.38	3.80	4.00	4.00	3.75	3.75	3.50
July	17.80	4.06	11.00	5.35	4.10	3.75	4.00	4.00	3.75	3.75	3.50
August	18.88	3.75	13.90	5.38	4.00	3.88	4.00	4.00	3.75	3.75	3.50
September	17.70	4.15	12.50	5.50	4.00	4.25	4.38	4.00	3.75	3.75	3.50
October	16.38	4.38	11.70	4.80	4.00	6.31	4.63	4.00	3.75	3.75	3.50
November	9.50	4.19	8.38	4.81	4.06	6.81	5.50	3.85	3.75	3.75	3.50
December	7.00	3.81	7.88	4.81	4.55	5.20	4.50	3.75	3.75	3.75	3.50
Average	12.27	4.63	8.00	6.27	4.42	4.61	4.96	4.11	3.75	3.75	3.50

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[1] Iron Age, Jan. 1, 1931, p. 136.

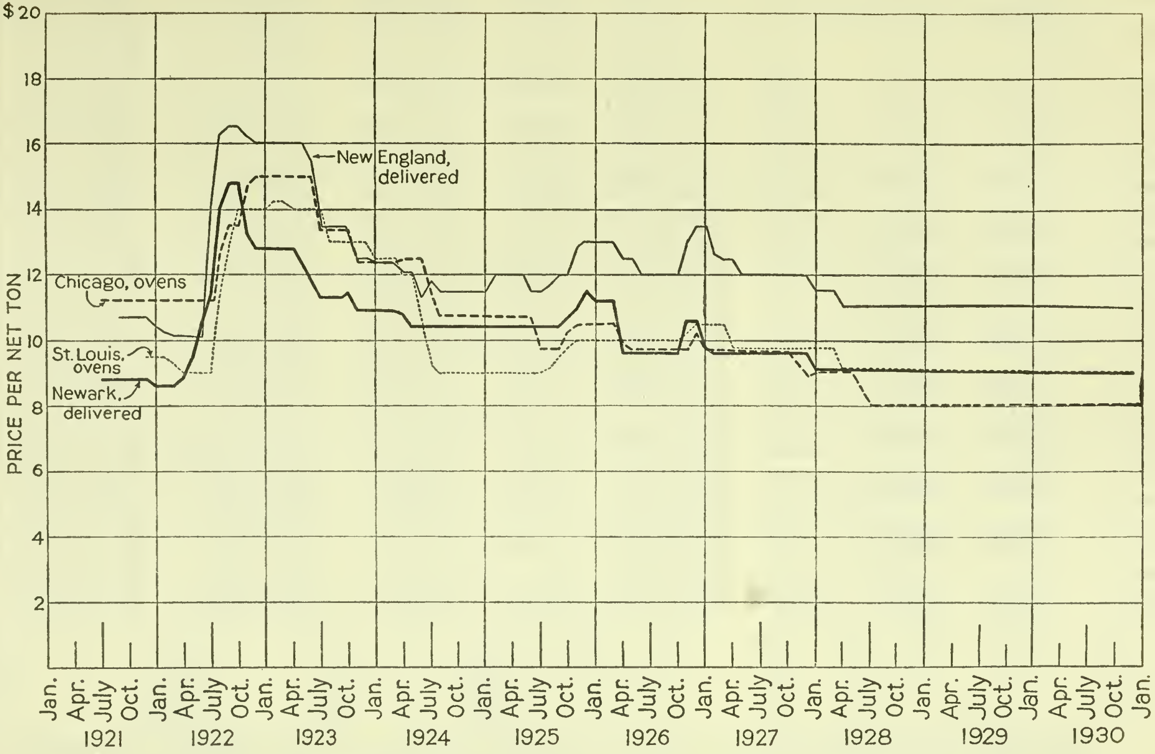

FIGURE 22.—Average monthly price of by-product foundry coke in four markets, 1921–1930, as quoted by Steel

TABLE 57.—*Average monthly prices of by-product foundry coke, in 10 markets, as quoted by Steel*

	January	February	March	April	May	June	July	August	September	October	November	December	Average for year
Ashland, Ky. (at ovens):[1]													
1926	(2)	(2)	(2)	(2)	(2)	$8.00	$7.50	$7.50	$7.50	$7.50	$7.50	$8.00	(2)
1927	$8.00	$8.00	$7.50	$7.50	$7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	$7.58
1928	7.50	7.50	7.50	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.13
1929	7.00	7.13	7.63	6.56	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.69
1930	6.50	6.50	6.50	6.50	6.50	6.50	6.30	5.50	5.50	5.50	5.50	5.50	6.06
Birmingham, Ala. (at ovens):													
1925	(2)	4.90	5.00	5.00	4.65	4.50	4.50	4.50	4.60	4.75	5.70	5.70	(2)
1926	5.60	5.50	5.50	5.15	5.15	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.45
1927	5.15	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.25	5.00	5.41
1928	5.00	5.00	5.00	3.95	4.80	5.00	5.00	5.00	5.00	5.00	5.00	5.00	4.90
1929	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1930	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Buffalo, N. Y. (at ovens):													
1927	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	9.00	9.00	9.00	9.00	(2)
1928	9.00	9.00	8.65	8.50	8.50	9.00	9.00	9.00	9.00	9.00	9.00	9.00	8.89
1929	9.00	8.75	8.75	8.95	9.00	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.81
1930	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.00	8.00	8.00	8.00	8.00	8.44
Chicago, Ill. (at ovens):													
1923	15.00	15.00	15.00	15.00	15.00	15.00	13.50	13.50	13.50	13.50	12.50	12.50	14.08
1924	12.50	12.50	12.50	12.50	12.50	12.50	11.45	10.75	10.75	10.75	10.75	10.75	11.68
1925	10.75	10.75	10.75	10.75	10.75	10.75	9.75	9.75	9.75	10.25	10.45	10.50	10.41
1926	10.50	10.50	10.50	9.95	9.75	9.75	9.75	9.75	9.75	9.75	9.75	10.25	10.00
1927	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.30	9.00	9.65
1928	9.00	9.00	9.00	9.00	9.00	8.50	8.00	8.00	8.00	8.00	8.00	8.00	8.46
1929	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1930	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
Detroit, Mich. (at ovens):													
1927	(2)	(2)	(2)	(2)	(2)	(2)	(2)	9.15	9.00	9.00	9.00	9.00	(2)
1928	9.00	9.00	9.00	9.00	9.00	8.90	8.50	8.50	8.50	8.50	8.50	8.50	8.74
1929	8.50	8.65	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	8.93
1930	9.00	9.00	9.00	8.90	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.66
Indianapolis, Ind. (delivered at consumers' works):													
1925	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	11.25	(2)
1926	11.25	11.25	11.25	10.75	10.75	10.75	10.25	10.25	10.25	10.25	10.25	10.25	10.63
1927	10.25	10.25	10.25	10.25	10.25	10.25	10.25	10.25	9.75	9.75	9.75	9.75	10.08
1928	9.75	9.75	9.75	8.75	8.75	8.75	8.50	8.25	8.25	8.25	8.25	8.25	8.77
1929	8.25	8.60	9.60	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.39
1930	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25
Newark, N. J. (delivered at consumers' works):													
1923	12.84	12.84	12.84	12.84	12.34	11.84	11.34	11.34	11.34	11.41	10.91	10.91	11.90
1924	10.91	10.91	10.91	10.81	10.41	10.41	10.41	10.41	10.41	10.41	10.41	10.41	10.57
1925	10.41	10.41	10.41	10.41	10.41	10.41	10.41	10.41	10.41	10.71	11.04	11.52	10.58
1926	11.01	11.01	11.01	9.59	9.59	9.59	9.59	9.59	9.59	9.59	10.59	10.59	10.11
1927	9.84	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.61
1928	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
1929	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
1930	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
New England[3] (delivered at consumers' works):													
1923	16.00	16.00	16.00	16.00	16.00	15.50	13.50	13.50	13.50	13.50	12.50	12.50	14.54
1924	12.50	12.50	12.50	12.00	12.00	11.30	11.80	11.50	11.50	11.50	11.50	11.50	11.84
1925	11.50	12.00	12.00	12.00	12.00	11.50	11.50	11.65	12.00	12.00	12.90	13.00	12.00
1926	13.00	13.00	13.00	12.50	12.50	12.00	12.00	12.00	12.00	12.00	13.00	13.50	12.54
1927	13.50	12.65	12.50	12.50	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.26
1928	11.50	11.50	11.50	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.13
1929	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
1930	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00

[1] Prices quoted at ovens, Ashland and Portsmouth, up to and including March, 1929, thereafter quoted on Connellsville ovens basis.

[2] No data.

[3] Before July, 1924, reported as "Boston, Mass., delivered at consumers' works."

TABLE 57.—*Average monthly prices of by-product foundry coke, in 10 markets, as quoted by Steel*—Continued

	January	February	March	April	May	June	July	August	September	October	November	December	Average for year
Portsmouth, Ohio (at ovens): [1]													
1926	(2)	(2)	(2)	(2)	(2)	7.50	7.50	7.50	7.50	7.40	7.90	8.00	(2)
1927	8.00	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.54
1928	7.50	7.50	7.50	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.13
1929	7.00	7.13	7.63	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.69
1930	6.50	6.50	6.50	6.50	6.50	6.50	6.30	5.50	5.50	5.50	5.50	5.50	6.06
St. Louis, Mo. (at ovens):													
1923	14.00	14.25	14.20	14.00	14.00	14.00	14.00	13.00	13.00	13.00	13.00	13.00	13.62
1924	12.50	12.50	12.50	12.00	12.00	10.60	9.20	9.00	9.00	9.00	9.00	9.00	10.53
1925	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.15	9.50	9.80	10.00	10.00	9.29
1926	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.25	10.50	10.06
1927	10.50	10.50	10.50	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.94
1928	9.75	9.75	9.75	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.19
1929	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
1930	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00

[1] Prices quoted at ovens, Ashland and Portsmouth, up to and including March, 1929, thereafter quoted on Connellsville ovens basis.

[2] No data.

SHIPMENTS BY RAIL AND WATER

Tables 58 to 60, which follow, show the quantity of by-product and beehive coke shipped by originating railroads and waterways. They are compiled from reports of the coke operators and therefore may not always agree with the records of the carriers themselves. In the by-product industry a large part of the coke produced is consumed close to the ovens and is not loaded for shipment. In 1930 shipments of by-product coke amounted to only 49.3 per cent of production. The beehive ovens, on the other hand, are usually situated at the mines, and the great bulk of the beehive coke produced must be transported some distance to reach the place of use. Table 59 indicates that in 1930, for the country as a whole, 96.9 per cent of the beehive coke produced was loaded for shipment.

In some localities, however, the furnaces that consume beehive coke are also located at the mines, and considerable quantities of the coke produced are used locally without appearing as railroad shipments. This fact is notable in the Birmingham district.

Water-borne shipments of beehive coke are practically confined to the Monongahela River, down which a comparatively small tonnage is transported from the Connellsville field to the Pittsburgh district. By-product coke moves in small quantities over several water routes, the most important being the Detroit, Hackensack, Hudson, and Monongahela Rivers.

TABLE 58.—*By-product coke loaded for shipment on originating railroads and waterways in the United States in 1930, by States, as reported by the coke producers*

State	Originating railroad or waterway	Shipments (net tons)	Production (net tons)	Per cent of State production shipped
	RAILROADS			
Alabama	Birmingham Southern; Illinois Central; Louisville & Nashville; Mobile & Ohio; St. Louis-San Francisco; Seaboard Air Line; Southern; Woodward Iron Co.	1,842,628	3,986,920	46.2
Colorado	Colorado & Wyoming	12,495	379,070	3.3
Illinois	Alton & Southern; Belt Railway of Chicago; Chicago & Illinois Western; Chicago, Milwaukee, St. Paul & Pacific; Chicago & North Western; Chicago Short Line; Elgin, Joliet & Eastern; Illinois Central; Illinois Terminal; Litchfield & Madison; Terminal Railroad Association.	1,822,928	3,576,577	51.0
Indiana	Chicago, Milwaukee, St. Paul & Pacific; Elgin, Joliet & Eastern; New York Central.	1,661,534	4,984,620	33.
Maryland	Pennsylvania	10,717	1,169,016	.9
Massachusetts	Boston & Albany; Boston & Maine	662,003	862,663	76.7
Michigan	Canadian Pacific; Delray Connecting; Detroit, Toledo & Ironton; Grand Trunk Railway System; Michigan Central; New York Central; Pennsylvania; Pere Marquette; Wabash.	1,357,140	2,603,815	52.1
Minnesota	Duluth, Missabe & Northern; Great Northern; Northern Pacific.	303,073	641,205	47.3
New Jersey	Delaware, Lackawanna & Western; Erie; Reading; Pennsylvania.	224,845	918,814	24.5
New York	Buffalo, Rochester & Pittsburgh; Delaware, Lackawanna & Western; Lehigh Valley; New York Central; New York, New Haven & Hartford; South Buffalo.	1,487,320	3,849,563	38.6
Ohio	Baltimore & Ohio; Erie; Fairport, Painesville & Eastern; Newburgh & South Shore; New York Central; Nickel Plate; Norfolk & Western; Pennsylvania; Pittsburgh & Lake Erie; River Terminal; Toledo Terminal; Wheeling & Lake Erie.	2,120,319	6,163,324	34.4
Pennsylvania	Central Railroad of New Jersey; Conemaugh & Black Lick; Lehigh Valley; Pennsylvania; Pittsburg & Ohio Valley; Reading; Union.	6,405,641	12,529,255	51.1
Tennessee	Central of Georgia; Nashville, Chattanooga & St. Louis; Southern.	72,462	100,439	72.1
Utah	Denver & Rio Grande Western; Union Pacific.	110,711	225,361	49.1
Washington	Northern Pacific	355	36,221	1.0
West Virginia	Baltimore & Ohio; Monongahela; Pennsylvania.	876,621	1,479,431	59.3
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin.	Chesapeake & Ohio; Chicago & North Western; Chicago, Milwaukee, St. Paul & Pacific; Grand Trunk Railway; Minneapolis, St. Paul & Sault Ste. Marie; Missouri Pacific; New York, New Haven & Hartford; Pere Marquette.	1,088,014	1,689,411	64.4
	Total railroad shipments	20,058,806		
	WATERWAYS			
Illinois	Calumet River; Lake Michigan	49,888	[1]	1.4
Maryland	Chesapeake Bay	85,148	[1]	7.3
Michigan	Detroit River	306,277	[1]	11.8
New Jersey	Hackensack River	384,709	[1]	41.9
New York	East River; Hudson River; Long Island Sound; Niagara River.	447,504	[1]	11.6
Connecticut, Massachusetts, and Rhode Island.	Boston Harbor; Long Island Sound; Narragansett Bay.	181,185	[1]	12.7
Ohio, Pennsylvania, and Wisconsin.	Delaware River; Lake Erie; Lake Michigan; Monongahela River.	762,726	[1]	[2]
	Total waterway shipments	2,217,437		
	Grand total	22,276,243	45,195,705	49.3

[1] Figures given under respective States above.

[2] Not at liberty to publish.

TABLE 59.—*Beehive coke loaded for shipment on originating railroads and waterways in the United States in 1930, by States, as reported by the coke producers*

State	Originating railroad or waterway	Shipments (net tons)	Production (net tons)	Per cent of State production shipped
	RAILROADS			
Colorado	Denver & Rio Grande Western	72,413	79,373	91.2
Pennsylvania	Baltimore & Ohio	84,687		
	Buffalo, Rochester & Pittsburgh	132,781		
	Huntingdon & Broad Top	197		
	Ligonier Valley	110,185		
	Monongahela	699,156		
	Pennsylvania	577,595		
	Pittsburgh & Lake Erie	18,428		
	Washington Run	18,104		
		1,641,133	2,011,324	81.6
Tennessee	Nashville, Chattanooga & St. Louis	11,439		
	Southern	12,023		
		23,462	25,473	92.1
Utah	Denver & Rio Grande Western	6,508	6,508	100.0
Virginia	Interstate	174,210		
	Norfolk & Western	46,678		
		220,888	219,656	[1] 100.6
Washington	Northern Pacific	12,252	12,252	100.0
West Virginia	Baltimore & Ohio	70,573		
	Chesapeake & Ohio	64,783		
	New York Central	216,408		
	Norfolk & Western	70,010		
		421,774	421,730	100.0
	Total railroad shipments	2,398,430		
	WATERWAYS			
Pennsylvania	Monongahela River	291,440	(2)	14.5
	Grand total	2,689,870	2,776,316	96.9

[1] Excess of shipments over production represents inclusion of screenings or withdrawal from stock.

[2] Figures given under Pennsylvania above.

TABLE 60.—*Beehive coke loaded for shipment on originating railroads and waterways in the United States in 1930, by routes, as reported by the coke producers*

Route	State	Quantity (net tons)		Per cent of total
		By States	Total	
Railroads:				
Baltimore & Ohio	Pennsylvania	84,687	155,260	5.8
	West Virginia	70,573		
Buffalo, Rochester & Pittsburgh	Pennsylvania	132,781	132,781	4.9
Chesapeake & Ohio	West Virginia	64,783	64,783	2.4
Denver & Rio Grande Western	Colorado	72,413	78,921	2.9
	Utah	6,508		
Huntingdon & Broad Top	Pennsylvania	197	197	(1)
Interstate	Virginia	174,210	174,210	6.5
Ligonier Valley	Pennsylvania	110,185	110,185	4.1
Monongahela	do	699,156	699,156	26.0
Nashville, Chattanooga & St. Louis	Tennessee	11,439	11,439	.4
New York Central	West Virginia	216,408	216,408	8.1
Norfolk & Western	Virginia	46,678	116,688	4.3
	West Virginia	70,010		
Northern Pacific	Washington	12,252	12,252	.5
Pennsylvania	Pennsylvania	577,595	577,595	21.5
Pittsburgh & Lake Erie	do	18,428	18,428	.7
Southern	Tennessee	12,023	12,023	.4
Washington Run	Pennsylvania	18,104	18,104	.7
Total railroad shipments		2,398,430	2,398,430	89.2
Waterway: Monongahela River	Pennsylvania	291,440	291,440	10.8
Grand total		2,689,870	2,689,870	100.0

(1) Less than one-tenth of 1 per cent.

TABLE 61.—*Shipments of coke over the Monongahela River, 1929 and 1930, as reported by the United States Engineer Office, Pittsburgh, Pa.*

Month	1929	1930	Month	1929	1930	Month	1929	1930
January	127,777	93,200	June	108,191	84,302	November	105,064	74,471
February	92,796	98,840	July	108,237	83,920	December	100,045	64,125
March	113,382	109,882	August	116,619	78,120			
April	109,234	115,385	September	110,224	63,917		1,309,698	1,050,288
May	108,843	113,644	October	109,286	70,482			

EXPORTS AND IMPORTS[1]

TABLE 62.—*Coke exported from the United States, 1909–1930*

Year	Net tons	Value	Year	Net tons	Value
1909	1,002,916	$3,232,673	1920	919,802	$9,993,665
1910	984,618	3,053,293	1921	306,755	2,760,939
1911	1,023,727	3,215,990	1922	511,541	4,319,538
1912	912,576	3,002,742	1923	1,237,342	11,889,897
1913	987,395	3,309,930	1924	659,350	4,926,478
1914	663,585	2,233,686	1925	953,812	6,871,962
1915	895,509	3,092,498	1926	987,260	6,979,896
1916	1,174,645	4,202,236	1927	806,664	5,430,704
1917	1,409,320	8,543,746	1928	1,097,666	7,394,531
1918	1,687,824	11,861,408	1929	1,238,035	7,840,368
1919	716,956	5,128,119	1930	1,003,866	6,067,318

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[1] Figures on exports and imports, unless otherwise indicated, compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

TABLE 63.—*Coke exported from the United States, 1928–1930, by customs districts*

District	1928		1929		1930	
	Net tons	Value	Net tons	Value	Net tons	Value
Alaska			1	$17		
Arizona	815	$6,548	1,038	8,421	1,089	$7,352
Buffalo	478,075	3,034,232	627,231	4,028,991	456,230	2,930,901
Chicago					15,954	76,271
Dakota	12,627	97,162	18,388	129,910	11,939	81,121
Duluth-Superior	3,922	25,391	3,528	20,941	2,450	17,704
El Paso	20	341	20	319	9	145
Florida	14,239	86,896	13,662	137,339	12,155	121,452
Galveston	8,543	62,850	553	3,723		
Los Angeles	83	833	35	481	7	112
Maine and New Hampshire	3,569	27,000	3,720	27,032	2,736	20,290
Maryland	5,007	32,481	5,347	30,711	741	2,889
Massachusetts	6,523	44,909				
Michigan	447,449	3,120,416	426,771	2,448,380	404,054	2,193,859
Mobile	12,112	152,845	26,362	239,447	12,333	148,122
New Orleans	5,488	88,193	5,338	56,038	11,250	62,625
New York	1,329	17,611	3,035	30,122	1,752	26,341
Ohio	69,671	385,149	71,690	386,433	53,981	243,188
Philadelphia	2,064	10,015	1,163	10,568	2,331	13,757
Porto Rico	31	467	53	748	37	564
Rochester			45	311	50	506
Sabine			9,184	123,000		
St. Lawrence	10,506	86,662	5,311	44,754	5,159	43,321
San Antonio	576	3,930	816	4,374	491	2,446
San Diego					34	354
San Francisco	60	1,118	43	764	35	616
Vermont	12,105	88,756	8,574	61,565	6,971	52,471
Virginia	2,105	11,794	3,916	30,250	1,145	10,198
Washington	747	8,932	2,211	15,729	933	10,713
	1,097,666	7,394,531	1,238,035	7,840,368	1,003,866	6,067,318

TABLE 64.—*Coke exported from the United States, 1928–1930, by countries of destination*

Destination	1928		1929		1930	
	Net tons	Value	Net tons	Value	Net tons	Value
Africa (British West)						
Argentina					177	$2,248
Australia	132	$1,239				
Belgium			336	$6,000	573	9,616
Bermudas	26	340				
Bolivia	22	270	45	540		
Brazil			37	499		
British India					354	3,448
Canada	1,044,484	6,913,605	1,170,008	7,179,895	960,459	5,670,345
Chile	4,445	29,127	5,667	32,931	1,052	5,284
Colombia	184	2,645	147	2,337	19	325
Costa Rica	59	774	38	651	16	266
Cuba	21,566	126,198	32,118	221,687	25,931	171,733
Dominican Republic	54	799	69	1,036	55	872
Ecuador	127	1,795	32	391		
France	2,247	28,312	15,349	221,593	1,401	25,020
French Oceania	11	221	2	40		
Germany	5,045	86,385	2,448	38,700	3,264	47,280
Guatemala	245	3,163	35	469	56	871
Haiti	30	228				
Honduras	91	1,349	127	1,126	2,010	10,359
Italy	7,709	85,809	5,422	78,490	4,716	76,610
Jamaica			1	23	6	109
Java and Madura					382	8,526
Mexico	2,019	17,540	2,333	18,068	1,903	12,915
Netherlands	4,379	52,057	1,143	10,406	560	5,000
Netherland West Indies			22	275	4	52
Newfoundland and Labrador	58	472	75	546	26	466
Nicaragua	35	648	34	622		
Norway	792	7,157				
Other British West Indies	58	550	28	275		
Panama	320	4,724	263	2,432	324	7,002
Peru	2,691	14,450	218	3,618	62	1,021
Salvador	59	1,074	58	1,066	222	2,699
Sweden			1	10		
Trinidad and Tobago	11	137	2	24	7	77
United Kingdom	675	12,113	1,881	14,824	223	3,980
Venezuela	92	1,350	95	1,786	64	1,194
Virgin Islands of the United States			1	8		
	1,097,666	7,394,531	1,238,035	7,840,368	1,003,866	6,067,318

TABLE 65.—*Coke exported from the United States, 1928–1930, by months*

Month	1928		1929		1930	
	Net tons	Value	Net tons	Value	Net tons	Value
January	72,411	$480,582	116,366	$716,605	113,550	$770,993
February	85,362	564,945	85,258	556,513	83,497	570,709
March	82,766	530,404	97,488	671,613	64,544	424,650
April	69,568	451,639	67,597	413,243	81,738	475,443
May	99,894	605,377	93,236	586,506	87,221	516,743
June	77,211	488,222	102,933	626,328	75,989	439,715
July	88,517	499,002	93,778	585,948	104,005	612,423
August	78,277	473,461	96,221	573,834	71,304	420,081
September	86,959	544,520	109,677	658,707	73,962	421,897
October	111,870	681,562	141,393	892,903	92,938	547,271
November	135,076	814,013	109,823	695,743	76,783	413,343
December	109,755	1,260,804	124,265	862,425	78,335	454,050
	1,097,666	7,394,531	1,238,035	7,840,368	1,003,866	6,067,318

TABLE 66.—*Coke imported for consumption in the United States, 1909–1930*

Year	Net tons	Value	Year	Net tons	Value
1909	191, 253	$736, 120	1920	41, 143	$403, 175
1910	172, 716	625, 130	1921	30, 990	336, 394
1911	77, 923	254, 455	1922	94, 228	802, 987
1912	123, 614	488, 398	1923	85, 002	862, 596
1913	101, 212	435, 157	1924	82, 833	795, 477
1914	133, 226	551, 104	1925	201, 579	1, 609, 474
1915	53, 222	222, 382	1926	284, 548	2, 174, 350
1916	54, 955	249, 514	1927	168, 859	1, 371, 568
1917	24, 872	146, 451	1928	147, 701	1, 132, 855
1918	30, 168	221, 880	1929	119, 724	1, 092, 235
1919	16, 486	140, 653	1930	132, 674	1, 044, 020

TABLE 67.—*Coke imported into the United States, 1928–1930, by customs districts*

District	1928		1929		1930	
	Net tons	Value	Net tons	Value	Net tons	Value
Arizona			30	$300		
Buffalo	22, 719	$450, 391	29, 344	534, 085	25, 097	$472, 504
Connecticut	3, 201	19, 474				
Duluth-Superior					6, 085	9, 509
Hawaii	672	4, 160			112	1, 486
Los Angeles	25, 448	157, 816	23, 450	166, 277	31, 522	156, 657
Maine and New Hampshire	1, 730	11, 652	459	3, 130	531	4, 320
Michigan	10, 670	65, 562	2, 336	14, 585	373	3, 810
Montana and Idaho	15, 948	121, 142	22, 638	170, 997	29, 219	200, 589
New York	8	84	189	2, 361	4	37
Oregon	3, 734	16, 539	3, 549	16, 313	4, 530	20, 571
Philadelphia	1, 232	4, 523				
Rhode Island	10, 071	40, 802				
Rochester			4, 968	29, 176	16	72
St. Lawrence	29	228			9	59
San Antonio	4, 560	34, 738	1, 686	13, 195	309	2, 277
San Francisco	35, 139	150, 646	16, 468	72, 183	23, 250	110, 956
Vermont	440	3, 085	124	883	572	3, 977
Washington	12, 100	52, 013	14, 483	68, 750	11, 045	57, 196
	147, 701	1, 132, 855	119, 724	1, 092, 235	132, 674	1, 044, 020

TABLE 68.—*Coke imported into the United States, 1928–1930, by countries of origin*

Country	1928		1929		1930	
	Net tons	Value	Net tons	Value	Net tons	Value
Belgium	5, 878	$24, 875	2, 014	$10, 152	2, 452	$13, 201
Canada	51, 152	648, 832	56, 762	733, 833	63, 928	705, 691
Chile					1	22
Germany	10, 951	51, 441	5, 846	33, 855	2, 857	15, 815
Mexico	4, 493	34, 204	1, 716	13, 495	309	2, 277
Netherlands	20, 247	138, 998	18, 136	153, 348	9, 499	57, 460
United Kingdom	54, 980	234, 505	35, 250	147, 552	53, 628	249, 554
	147, 701	1, 132, 855	119, 724	1, 092, 235	132, 674	1, 044, 020

COKE IN CANADA

Most of the coke exported from the United States goes to Canada. The tonnage exported has tended to increase (Table 62), although in 1930 it declined slightly from the previous year. These increased shipments to Canada are largely absorbed by the domestic market. At the same time, Canada has increased her own production of domestic coke through the construction of new by-product ovens. Tables 69 and 70 have been abstracted from the reports of the Dominion Bureau of Statistics, which should be consulted for details. The tables include gas-house coke.

TABLE 69.—*Coke produced, coal consumed, etc., in Canada, 1930, by months, in net tons* [1]

Month	Bituminous coal consumed	Coke produced	Disposition of coke by operators		
			Used in coke plant	Used in own smelters	Sold
January	312,089	224,690	26,570	97,221	132,795
February	281,140	203,951	24,885	89,730	114,728
March	309,159	224,334	25,386	102,533	105,422
April	295,472	213,190	24,638	94,594	81,672
May	289,933	209,555	26,484	91,767	50,527
June	268,473	193,198	23,398	81,465	50,351
July	247,591	182,118	22,198	67,481	70,742
August	244,132	181,835	23,271	63,567	56,230
September	232,840	170,060	25,951	53,294	67,388
October	248,914	185,274	26,437	82,893	110,798
November	248,518	184,635	24,916	68,900	95,703
December	246,366	181,186	27,606	58,303	126,756
Total	[2] 3,224,627	2,354,026	301,740	951,748	1,063,112

[1] Abstracted from Dominion Bureau of Statistics, 1930, Quarterly Report, vol. 9, No. 4. Includes breeze and gas-house coke.

[2] Of this total 2,489,352 tons were imported, chiefly from the United States.

TABLE 70.—*Production, imports, and consumption of coke in Canada, 1930, by months, in net tons* [1]

Month	Canadian production				Imports	Apparent consumption [2]
	Eastern Provinces	Ontario	Western Provinces	Total Canada		
January	64,445	141,608	18,637	224,690	114,438	336,792
February	59,092	128,965	15,894	203,951	98,683	300,165
March	65,535	142,450	16,349	224,334	79,466	300,609
April	59,940	137,162	16,088	213,190	54,695	266,489
May	52,724	142,172	14,659	209,555	113,563	320,872
June	50,006	129,747	13,445	193,198	87,286	278,025
July	51,680	116,947	13,491	182,118	90,713	270,256
August	57,204	109,626	15,005	181,835	97,104	277,052
September	53,389	101,189	15,482	170,060	80,672	248,069
October	54,313	114,197	16,764	185,274	85,352	268,404
November	51,897	115,266	17,472	184,635	87,746	268,838
December	54,396	110,086	16,704	181,186	71,322	249,694
Total	674,621	1,489,415	189,990	2,354,026	1,061,040	3,385,265

[1] Abstracted from Dominion Bureau of Statistics, 1930, Quarterly Report, vol. 9, No. 4. Includes breeze and gas-house coke.

[2] Allowing for exports which ordinarily are small.

WORLD PRODUCTION

TABLE 71.—*Coke produced in the principal countries of the world, 1926–1930, in metric tons* [1]

[Compiled by M. T. Latus, of the Bureau of Mines]

Country	1926	1927	1928	1929	1930
Australia:					
New South Wales	607,255	720,727	528,550	471,813	373,675
Queensland	6,290	4,263	4,123	4,144	3,499
Belgium	5,076,954	5,879,970	6,322,920	6,192,960	(2)
Bulgaria	1,582	1,448	898	------------	------------
Canada	1,329,314	1,366,623	1,675,421	1,986,532	1,705,941
Chile	(2)	(2)	(2)	(2)	494,102
China (exports)	14,551	[3] 12,989	14,211	13,467	10,557
Chosen	119,338	130,356	(4)	(4)	(2)
Czechoslovakia	1,961,762	2,428,584	2,821,423	3,170,629	2,714,670
France	6,908,000	7,118,000	7,957,000	9,085,000	9,167,000
Germany	27,297,398	33,242,495	34,774,959	39,421,033	32,458,831
Saar [5]	2,109,000	2,232,000	2,373,000	2,423,000	2,560,000
Great Britain [6]	4,790,420	12,027,121	12,035,326	13,637,421	11,698,821
Hungary	------------	457	1,072	2,092	(2)
India, British [7]	554,045	661,506	757,501	843,504	(2)
Indo-China	2,565	(4)	2,500	637	6,000
Italy	591,528	578,445	636,599	791,607	813,325
Japan:					
Japan proper—					
Manufactured coke	1,035,409	1,086,023	1,237,754	(4)	(2)
Natural coke	130,381	143,447	165,883	(4)	(2)
Taiwan	[8] 15,602	(4)	(4)	(4)	(2)
Netherlands	1,198,609	1,478,822	1,573,392	2,402,566	3,299,403
Peru	25,960	13,812	19,331	35,899	(2)
Poland	1,113,380	1,402,008	1,667,906	1,858,052	1,581,974
Rhodesia, Southern	153,069	146,966	139,719	100,001	77,043
Russia [9]	2,755,841	3,327,904	5,103,741	(4)	(2)
Spain	693,739	714,243	680,555	768,040	675,546
Sweden	112,542	115,756	104,805	103,778	93,892
Union of South Africa	80,312	98,249	94,089	99,297	89,429
United States	51,587,278	46,349,770	47,904,391	54,325,427	43,519,258
	110,272,000	121,299,000	128,742,000	144,292,000	(2)

[1] Gas-house coke is not included.
[2] Data not available.
[3] Production estimated as 500,000 tons in 1927 (General Statement on the Mining Industry. China Geol. Surv. Special Rept. No. 3, Peiping). Similar figures not available for other years.
[4] Estimate included in total.
[5] Revised figures. (Germany, Reichskohlenrat-Statistische Uebersicht über die Kohlenwirtschaft.)
[6] In Great Britain the production of gas-house coke (including breeze), not included above, is especially important and was as follows: 1926, 11,784,401 tons; 1927, 12,562,447 tons; 1928, 12,411,903 tons; 1929, 12,610,467 tons; 1930, 12,514,392 tons.
[7] Figures represent only coke made at collieries.
[8] Includes a small quantity of gas-house coke.
[9] Year ended Sept. 30.

COKE-OVEN BY-PRODUCTS

The nature of the raw organic materials out of which coal is formed and the geologic processes that have aided in its formation have resulted in a product of complex chemical composition from which many simpler substances can be obtained. Various methods of treating coal for the purpose of obtaining useful products therefrom have been devised, the most important being high-temperature carbonization, low-temperature carbonization, and hydrogenation; that is, the treatment of coal with hydrogen. By far the most important of these processes is the high-temperature carbonization of coal in the familiar beehive and by-product coke ovens, which manufacture coke as their primary product, and the retort ovens designed primarily to produce gas for public-utility distribution. Treatment of coal by low-temperature carbonization has for its purposes the recovery of larger quantities of tar and light oil than are obtainable in the high-temperature process, and the production of a smokeless domestic fuel. Much experimental work has been done in the field of low-temperature carbonization; but the commercial exploitation of this process is insignificant, particularly in the United States. The most recent attempt to engage in the treatment of coal by low-temperature processes was the operation of a plant using the KSG process, at New Brunswick, N. J. This plant is owned by the International Combustion Engineering Co., whose original plant in Essen, Germany, has been in operation for a number of years. The attempt to treat American coals was not entirely satisfactory, and the New Brunswick plant suspended operation after a brief run in 1929. (See Coke and By-Products in 1928, p. 716, and 1929, p. 581.) The commercial success of the process depends upon its ability to make and sell a smokeless domestic fuel in competition with anthracite, high-temperature coke, briquets, or fuel oil. So far it has not made an appreciable contribution to the domestic fuel supply. It received much attention as a possible source of motor fuel in the event that petroleum supplies become exhausted, but it now appears that the production of oils from coal either by synthesis or by hydrogenation is better adapted to meet this need.[8]

The treatment of coal by hydrogenation differs from carbonization in that, by this process, coal is converted into a liquid fuel by heating it with hydrogen under pressure and is not recovered from one or more of the commercial by-products obtained in the manufacture of coke or gas. The conversion of coal into liquid fuels is attracting attention in Europe since the publication of the experimental work of Fischer,[9] Bergius,[10] Patart,[11] and others.

The production of liquid fuels from coal is still in the experimental state or in the early stages of development. The value of the process depends upon a possible need for supplementing the oil supply as a source of liquid fuels. In the United States this process has been received with greater interest by the oil refiners in the treatment of refractory crudes than by the producers of coal.

SCOPE OF PRESENT DISCUSSION

The present discussion is confined to the products of coal obtained in the high-temperature by-product ovens. These products fall into five general groups, some of which are further subdivided. They are: (1) Tar, (2) ammonium sulphate and ammonia liquor, (3) gas, (4) light oil and its derivatives, and (5) miscellaneous products.

These products have been growing in quantity of output and value year by year and in 1930 represented approximately 46 per cent of the total value of the output of by-product ovens, as compared with 26 per cent in 1913. The total value also has increased from $17,000,000 in 1913 to $168,000,000 in 1930. This rapid increase over 1913 is explained by the extensive replacement of beehive ovens by by-product ovens in this period.

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[8] For a discussion of low-temperature carbonization, the reader is referred to Fieldner, A. C., Low-Temperature Carbonization of Coal: Tech. Paper 396, Bureau of Mines, 1928, 44 pp.

[9] Fischer, Franz, The Synthesis of Petroleum: Proc. Internat. Conference on Bituminous Coal, 1926, p. 234.

[10] Bergius, Friedrich, The Transformation of Coal into Oils by Hydrogenation: Proc. Internat. Conference on Bituminous Coal, 1926, p. 102.

[11] Patart, George, The Industrial Transformation of Bituminous Coal into Organic Technical Products: Proc. Internat. Conference on Bituminous Coal, 1926, p. 132.

The by-products of the coke industry find an increasingly wide field of usefulness. Some of these by-products, such as tar and gas, are used, in part, in the metallurgical industries closely associated with the manufacture of coke; some form the raw materials for further treatment and manufacture of products by separately established plants; and some enter directly into the market as consumers' goods. Moreover, several of these products enter the market in competition with materials derived from other sources, so that interesting problems of market analysis arise.

SUMMARY OF BY-PRODUCTS IN 1930

The gross value of the by-products in 1930 was $144,093,721, which was exceeded only in 1928 and 1929. (See Table 72.) This gross value does not include breeze or tar used by the producer but not sold. If these two items are added the gross value of all products amounts to $168,000,000.

TABLE 72.—*By-products obtained from coke-oven operations in the United States, 1929 and 1930* [1]

[Exclusive of screenings and breeze]

Product	Production	Sales		
		Quantity	Value	
			Total	Average
1929				
Tar ..... gallons	680, 864, 366	333, 557, 501	$16, 982, 406	$0. 051
Ammonia:				
Sulphate ..... pounds	1, 488, 314, 447	1, 433, 465, 592	25, 861, 479	. 018
Ammonia liquor (NH_3 content) ..... do	56, 028, 347	55, 470, 678	2, 820, 802	. 051
Sulphate equivalent of all forms ..... do	1, 712, 427, 835	1, 655, 348, 304	28, 682, 281	----------
Gas:				
Used under boilers, etc ..... M cubic feet	[2] 843, 148, 089	18, 506, 502	1, 282, 327	. 069
Used in steel or affiliated plants ..... do		302, 165, 465	31, 901, 504	. 106
Distributed through city mains ..... do		160, 560, 921	46, 994, 632	. 293
Sold for industrial use ..... do		26, 357, 691	4, 125, 807	. 157
	----------	507, 590, 579	84, 304, 270	. 166
Light oil and derivatives:				
Crude light oil ..... gallons	[3] 200, 594, 027	11, 090, 709	1, 374, 527	. 124
Benzol, crude and refined ..... do	24, 944, 531	24, 558, 745	5, 169, 743	. 211
Motor benzol ..... do	105, 923, 762	100, 807, 852	16, 063, 285	. 159
Toluol, crude and refined ..... do	18, 343, 295	17, 064, 206	6, 580, 176	. 386
Solvent naphtha and xylol ..... do	7, 131, 111	6, 581, 047	1, 591, 333	. 242
Other light oil products ..... do	6, 675, 386	1, 877, 176	124, 948	. 067
	[4] 163, 018, 085	161, 979, 735	30, 904, 012	. 191
Naphthalene, crude and refined ..... pounds	19, 761, 382	19, 659, 367	320, 272	. 016
Creosote oil, including distillate as such and in coal-tar solution ..... gallons	[5] 24, 520, 839	23, 938, 431	2, 296, 862	. 096
Phenol (crude) ..... do	84, 683	78, 869	28, 347	. 359
Pitch of tar ..... net tons	88, 158	5, 599	27, 273	4. 871
Other products [6]	----------	----------	129, 848	----------
Value of all by-products sold	----------	----------	163, 675, 571	----------

[1] Includes products of tar distillation conducted by coke-oven operators under same corporate name, excepting, however, phenol, and other tar acids produced at Clairton, Pa., which are covered by report of the U. S. Tariff Commission.

[2] Includes gas wasted and gas used for heating retorts.

[3] Refined on the premises to make the derived products shown; 1929, 194,882,679 gallons of crude oil; 1930, 173,328,254 gallons.

[4] Total gallons of derived products.

[5] 1929 production figures revised.

[6] Crude products, tar paint, carbolate, sodium prussiate, sulphur, smoke compound, extil covering, and cyanogen.

TABLE 72.—*By-products obtained from coke-oven operations in the United States, 1929 and 1930*—Continued

[Exclusive of screenings and breeze]

Product	Production	Sales		
		Quantity	Value	
			Total	Average
1930				
Tar..........gallons	602,485,929	314,865,294	$15,562,963	$0.049
Ammonia:				
Sulphate..........pounds	1,341,919,960	1,310,588,322	20,448,633	.016
Ammonia liquor (NH_3 content)..........do	49,031,133	45,368,290	2,236,063	.049
	----------	----------	22,684,696	----------
Sulphate equivalent of all forms..........do	1,538,044,492	1,492,061,482	----------	----------
Gas:				
Used under boilers, etc..........M cubic feet	[2] 724,103,004	20,408,659	1,185,415	.058
Used in steel or affiliated plants..........do		231,232,552	24,903,906	.108
Distributed through city mains..........do		164,689,727	48,938,752	.297
Sold for industrial use..........do		25,787,390	4,266,064	.165
	----------	442,118,328	79,294,137	.179
Light oil and derivatives:				
Crude light oil..........gallons	[3] 178,325,952	9,941,904	983,540	.099
Benzol, crude and refined..........do	19,142,910	19,187,627	3,377,026	.176
Motor benzol..........do	101,862,692	102,572,989	14,427,422	.141
Toluol, crude and refined..........do	11,833,202	12,083,423	3,613,778	.299
Solvent naphtha..........do	4,078,274	3,647,773	651,146	.179
Xylol..........do	2,040,024	1,891,764	481,863	.255
Other light oil products..........do	6,475,725	1,983,034	120,115	.061
	[4] 145,432,827	151,308,514	23,654,890	.156
Naphthalene, crude and refined..........pounds	12,640,102	13,028,904	161,264	.012
Tar derivatives:				
Creosote oil, including distillate as such and in coal-tar solution..........gallons	25,679,882	28,570,764	2,500,076	.088
Phenol (crude)..........do	136,971	104,546	38,241	.366
Pitch of tar..........net tons	106,334	7,465	46,914	6.284
Other tar derivatives..........	----------	----------	55,376	----------
Other products [6]..........	----------	----------	95,164	----------
Value of all by-products sold..........	----------	----------	[7] 144,093,721	----------

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[2] Includes gas wasted and gas used for heating retorts.
[3] Refined on the premises to make the derived products shown; 1929, 194,882,679 gallons of crude oil; 1930, 173,328,254 gallons.
[4] Total gallons of derived products.
[6] Crude products, tar paint, carbolate, sodium prussiate, sulphur, smoke compound, extil covering, and cyanogen.
[7] Exclusive of the value of breeze production, which in 1930 amounted to $9,408,549.

TREND OF YIELDS AND PRICES

The long-time trends of by-product yields and unit prices are given in Tables 73 to 77 and Figures 23 to 27. In relation to the value of the coke, the value of the by-products continues to increase. In 1913 the by-products contributed 27 per cent of the total gross value of all products, reckoned per ton of coke produced. In 1930 their share had increased to 46 per cent. The change is brought about partly by the recovery of additional by-products and partly by changes in prices received. Yields per ton have increased somewhat, although the slight changes from 1928 and 1929 indicate that maximum possible recovery is being approached. These increases are partly the result of selection of better coals and partly of improvements in oven design and by-product recovery equipment. The notable advance in the yield of surplus gas is due both to improvements in oven design and to the growing use of producer gas and blast-furnace gas for underfiring. Changes in unit prices are shown in Figure 24 and Table 75. In comparison with the war period, prices of tar and gas have increased while prices of ammonia and the benzol products have declined. The result of these changes has been a notable shift in the relative gross receipts from the several products. (See Figure 25 and Table 76.) In 1913 ammonia furnished the largest gross income per ton of coke produced; during the war its position was taken by members of the benzol group, which were in demand for the manufacture of high explosives; to-day both ammonia and the benzols are subordinate to gas and even to tar. In fact, gas has increased so far in yield and price as to contribute 47 per cent of the value of all the by-products.

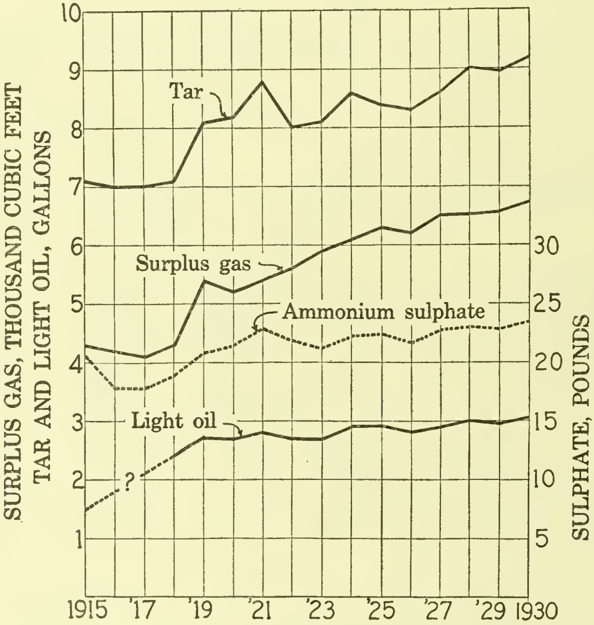

FIGURE 23.—Average yield of the principal by-products per net ton of coal carbonized in by-product coke ovens, 1915–1930. Figures for light oil represent the average at plants recovering light oil

TABLE 73.—*Average yield of coke and by-products per net ton of coal charged in by-product ovens in the United States, 1915, 1917, and 1924–1930*

Product	1915	1917	1924	1925	1926	1927	1928	1929	1930
Coke .... pounds..	1,440	1,424	1,386	1,398	1,394	1,388	1,378	1,392	1,380
Tar .... gallons..	7.1	7.0	8.6	8.4	8.3	8.65	9.00	8.87	9.20
Ammonium sulphate (or equivalent) .... pounds..	20.1	17.8	22.2	22.4	21.7	22.69	22.77	22.31	23.47
Light oil .... gallons..	1.5	(1)	[2] 2.9	[2] 2.9	[2] 2.8	[2] 2.92	[2] 2.97	[2] 2.93	[2] 3.06
Gas:									
Total .... M cubic feet..	11.0	10.7	11.0	11.2	11.1	11.08	11.05	10.98	11.05
Surplus sold or used .... do....	4.3	4.1	6.1	6.3	6.2	6.46	6.48	6.61	6.75
Burned in coking process .... do....	6.3	6.0	4.7	4.7	4.7	4.44	4.31	4.13	4.05
Wasted .... do....	.4	.6	.2	.2	.2	.18	.26	.24	.25

[1] Records not comparable.

[2] Average for plants now recovering light oil.

TABLE 74.—*Coal equivalent of the by-products of by-product coking, 1914–1930*

Year	Quantity of by-products				Rough equivalent in heating value (billion B. t. u.)					Coal equivalent	
	1	2	3	4	5	6	7	8	9	10	11
	Coke breeze (thousand net tons)	Surplus gas (billion cubic feet)	Tar produced (thousand gallons)	Light oil produced (thousand gallons)	Coke breeze (1×20)	Surplus gas (2×550)	Tar (3× 0.150)	Light oil (4× 0.130)	Total (5+6+ 7+8)	Net tons (9÷0.0262)	Per cent which this forms of coal made into coke
1914	667	61	109, 901	8, 464	13, 340	33, 550	16, 485	1, 100	64, 475	2, 461, 000	4. 8
1915	841	84	138, 415	16, 601	16, 820	46, 200	20, 762	2, 158	85, 940	3, 280, 000	5. 3
1916	1, 031	110	185, 506	43, 710	20, 620	60, 500	27, 826	5, 682	114, 628	4, 375, 000	5. 4
1917	1, 496	131	221, 999	54, 387	29, 920	72, 050	33, 300	7, 070	142, 340	5, 432, 000	6. 5
1918	1, 999	158	263, 299	87, 562	39, 980	86, 900	39, 495	11, 383	177, 758	6, 785, 000	8. 0
1919	1, 849	193	288, 902	92, 473	36, 980	106, 150	43, 335	12, 021	198, 486	7, 575, 000	11. 5
1920	2, 461	230	360, 664	109, 710	49, 220	126, 500	54, 100	14, 262	244, 082	9, 316, 000	12. 2
1921	1, 831	154	253, 052	76, 917	36, 620	84, 700	37, 958	9, 999	169, 277	6, 461, 000	17. 4
1922	2, 395	231	327, 780	101, 438	47, 900	127, 050	49, 167	13, 187	237, 304	9, 058, 000	16. 7
1923	3, 333	318	440, 907	135, 647	66, 660	174, 900	66, 136	17, 634	325, 330	12, 417, 000	14. 7
1924	2, 951	301	422, 074	128, 957	59, 020	165, 550	63, 311	16, 764	304, 645	11, 628, 000	17. 9
1925	3, 546	362	480, 849	146, 443	70, 920	199, 100	72, 127	19, 038	361, 185	13, 786, 000	18. 5
1926	4, 183	398	529, 486	164, 060	83, 660	218, 900	79, 423	21, 328	403, 311	15, 394, 000	18. 6
1927	4, 100	408	546, 859	164, 488	82, 000	224, 400	82, 029	21, 383	409, 812	15, 642, 000	21. 0
1928	4, 378	454	631, 845	188, 598	87, 560	249, 700	94, 777	24, 518	456, 555	17, 426, 000	22. 6
1929	4, 853	508	680, 864	200, 594	97, 060	279, 400	102, 130	26, 077	504, 667	19, 262, 000	22. 2
1930	4, 337	442	602, 486	178, 326	86, 740	243, 100	90, 373	23, 182	443, 395	16, 923, 000	24. 2

TABLE 75.—*Average receipts per unit of coke-oven by-products sold, 1913–1930*

[The figures in this table for 1913 to 1917 represent "average value of by-products produced and sold." For 1918 to 1930 they represent "average receipts from sales." The two sets of figures are probably comparable for practical purposes]

	Tar	Sulphate	Surplus gas	Benzol, refined	Motor benzol	Toluol, refined	Solvent naphtha[1]	Naphthalene	
								Crude	Refined
Unit	Gallon	Pound	M cubic feet	Gallon	Gallon	Gallon	Gallon	Pound	Pound
	Cents	*Cents*	*Cents*	*Cents*	*Cents*		*Cents*	*Cents*	
1913	2. 5	3. 1	8. 8	[2] 27. 0	(3)	[2] $0. 29	[2] 25. 0	(3)	
1914	2. 6	2. 8	9. 8	[2] 26. 0	(3)	[2] . 33	[2] 25. 0	(3)	
1915	2. 6	2. 8	10. 2	56. 8	(4)	2. 45	24. 0	[5] 10. 0	
1916	2. 6	3. 1	9. 8	62. 4	(4)	2. 85	28. 4	[5] 3. 4	
1917	2. 7	3. 4	8. 7	45. 0	(4)	1. 37	16. 6	[5] 3. 3	
1918	3. 2	4. 5	8. 7	27. 5	(4)	1. 43	14. 1	2. 8	6. 6
1919	3. 2	3. 8	8. 6	20. 6	(6)	. 263	15. 2	2. 0	4. 1
1920	3. 7	4. 3	14. 0	26. 0	22. 7	. 300	18. 1	2. 7	6. 1
1921	4. 2	2. 5	16. 8	23. 9	17. 9	. 283	17. 7	2. 5	5. 6
1922	4. 0	2. 5	16. 7	28. 5	19. 1	. 292	18. 8	1. 6	5. 0
1923	4. 4	2. 9	16. 2	24. 8	16. 3	. 291	17. 9	1. 7	5. 5
1924	4. 6	2. 4	16. 5	20. 9	15. 2	. 241	18. 7	1. 5	3. 6
1925	4. 9	2. 3	17. 0	22. 4	16. 6	. 261	20. 2	1. 0	2. 5
1926	5. 1	2. 1	16. 3	22. 8	18. 8	. 338	29. 2	1. 3	(7)
1927	5. 3	2. 0	17. 2	[5] 20. 6	16. 9	. 340	25. 3	1. 1	--------
1928	5. 3	1. 9	16. 8	[5] 19. 7	16. 4	[5] . 341	23. 4	[5] 1. 2	
1929	5. 1	1. 8	16. 6	[5] 21. 1	15. 9	[5] . 386	24. 2	[5] 1. 6	
1930	4. 9	1. 6	17. 9	[5] 17. 6	14. 1	[5] . 299	20. 5	[5] 1. 2	

[1] Includes xylol.
[2] Trade quotations, New York market; used to avoid disclosing individual operators' reports.
[3] No data.
[4] Not reported during the war.
[5] Crude and refined not separated.
[6] Data uncertain.
[7] Sales too small to be representative.

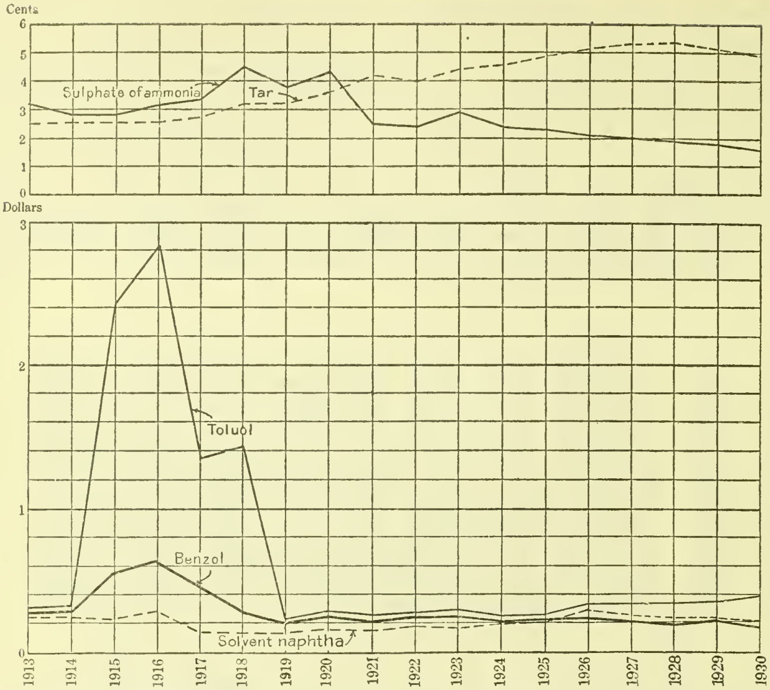

FIGURE 24.—Average receipts per unit for the principal refined light oils and other products at by-product coke plants, 1913–1930

TABLE 76.—*Value of by-products and of coke, including breeze, per ton of coke produced in the United States, 1915, 1917, 1918, and 1924–1930*

Product	1915	1917	1918	1924	1925	1926	1927	1928	1929	1930
Ammonia and its compounds	$0.70	$0.79	$1.02	$0.80	$0.69	$0.63	$0.62	$0.57	$0.54	$0.502
Light oil and its derivatives (including naphthalene)	.52	1.30	.99	.50	.54	.62	.58	.60	.58	.527
Surplus gas sold or used	.61	.51	.53	1.46	1.54	1.46	1.60	1.58	1.58	1.754
Tar sold	.25	.25	.24	.28	.30	.32	.37	.36	.32	.344
Miscellaneous products	.03	.06	.09	-------	-------	-------	-------	.02	.05	.061
	2.11	2.91	2.87	3.04	3.07	3.03	3.17	3.13	3.07	3.188
Tar used, not sold	(1)	(1)	.08	.29	.29	.28	.29	.33	.33	.312
Breeze produced	(2)	.10	.12	.18	.22	.21	.20	.20	.20	.208
Total value of by-products including those not sold	2.19	3.01	3.07	3.51	3.58	3.52	3.66	3.66	3.60	3.708
Value of coke produced	3.45	6.18	7.42	[3] 5.76	[3] 5.28	[3] 5.65	[3] 5.29	[3] 4.90	[3] 4.80	[3] 4.416
Total value of coke and by-products	5.64	9.19	10.49	9.27	8.86	9.17	8.95	8.56	8.40	8.124

[1] Included in tar sold.
[2] Estimate included in total.
[3] The average receipts per ton of coke sold during these years were $6.90 in 1924, $6.61 in 1925, $6.95 in 1926, $6.57 in 1927, $5.95 in 1928, $5.94 in 1929, and $5.799 in 1930.

The figures given in Table 76 and Figure 25 are a composite of the experiences of all by-product coke-oven plants and are dominated by the large establishments associated with iron furnaces, at which gas is credited at relatively low prices. Table 77 has been prepared to show the experience of nonfurnace or merchant plants only. (See pp. 500 to 501 for definition of furnace and merchant plants.) At these

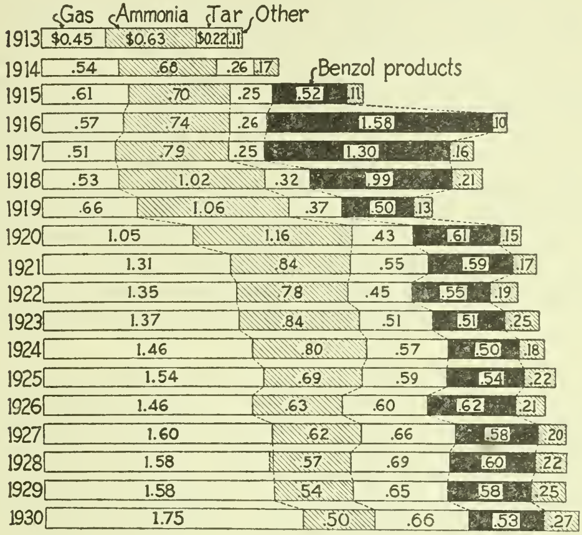

FIGURE 25.—Gross value of the several by-products per ton of by-product coke produced, 1913–1930

nonfurnace plants the gross value of gas per ton of coke produced in 1930 was $3.55.

TABLE 77.—*Gross value f. o. b. plant of all products reported by nonfurnace by-product coke plants, 1930*

[Values added by distribution not included. Plants include by-product plants operated by city gas companies and alkali manufacturers as well as merchant coke plants]

Product	Total value	Per cent of total value	Value per ton of coke produced	Value per M cubic feet of surplus gas produced
Coke:				
Used by producer	$9, 586, 493	7. 16		$0. 068
Sold for furnace use	5, 362, 127	4. 00		. 038
Sold for foundry use	9, 627, 913	7. 19		. 068
Sold for other industrial use	8, 166, 248	6. 10		. 058
Sold for domestic use	38, 599, 985	28. 83		. 273
Total coke	71, 342, 766	53. 28	$5. 96	. 505
Breeze:				
Used by producer for steam raising or other use	2, 189, 821	1. 64		. 015
Sold	578, 649	. 43		. 004
Total breeze	2, 768, 470	2. 07	. 23	. 019
Tar	7, 469, 092	5. 58	. 62	. 053
Ammonia	5, 638, 043	4. 21	. 47	. 040
Surplus gas:				
Used under boilers	366, 116	. 27		. 002
Used in affiliated plants	185, 207	. 14		. 001
Distributed through city mains	39, 727, 357	29. 67		. 281
Sold for industrial use	2, 345, 330	1. 75		. 017
Total gas	42, 624, 010	31. 83	3. 55	. 301
Light-oil products	4, 056, 710	3. 03	. 34	. 029
Naphthalene	937			
Total gross value	133, 900, 028	100. 00	11. 17	. 947
Cost of coal carbonized	71, 255, 979		5. 94	. 504

TAR

Outside of coke and gas, tar is by far the most important product of the coke oven, judged either by its weight or by the heat that it contains. Tar finds an outlet as a fuel for open-hearth furnaces or other metallurgical operations, as a raw material for the manufacture of coal-tar products, and as a fuel under boilers. The quantity used as fuel by the producers themselves or affiliated steel plants has risen from 24 per cent in 1918 to 46 per cent in 1930 and has occasionally reached 50 per cent in intervening years. The growing consumption of tar in metallurgical work is a reflection of the increasing quantities made available each year and the economy of tar as a metallurgical fuel in the competitive energy market. The economic advantage to the producer of burning tar in operations of his own plant rather than disposing of it in the market is ably discussed by R. S. McBride (Coke and By-Products in 1924, pp. 701–703) and will not be repeated here.

In the United States the refining of tar into its derivatives has developed as a distinct industry carried on by corporations separate from the makers of coke. Some of the tar-refining companies are affiliated financially with the coke producers, and the distillation plants are often located adjacent to coke ovens; however, even these companies are under distinct management. Bureau of Mines reports on the coke industry have therefore not included the operation of tar distillers. The United States Tariff Commission, on the other hand, follows the distillation closely in its annual Census of Dyes and Other Synthetic Organic Chemicals. In 1930, according to the Tariff Commission, the firms engaged primarily in tar distillation produced the following crude materials not covered by reports of the Bureau of Mines.

TAR DERIVATIVES

The principal products of industrial importance obtained from coal tar are road oils, roofing materials, pitch, wood-preserving compounds, solvents, dyestuffs, intermediates, and small amounts of light oils not previously separated at the coke-oven plant. These products are classified as creosote oil, crude phenol, pitch of tar, and other derivatives. By far the most important of these are creosote oil (used principally as a wood preservative), pitch tar, and refined tar, which together comprise 90 per cent of the total value. Among the minor products of tar distillation are motor fuel, benzol, toluol, and solvent naphtha, all of which are obtained in much larger quantities by the by-product operator from the light oil stripped from the gas.

The most interesting development in the tar-refining industry is the rapid growth of creosote recovery since 1928. The sale of domestically produced creosote has risen from 7,400,000 gallons in 1928, to 28,600,000 gallons in 1930. Until recently the only important source of creosote oil was the tar refinery, but since 1928 a few of the by-product coke plants have begun to strip the creosote oil from their tar by a process of fractional distillation, which relieves them of the necessity of handling the entire run of tar derivatives. The production of creosote oil from this new source promises to be an important element in the national supply of this indispensable product.

The total quantity of tar produced at coke ovens in 1930 was 602,485,929 gallons. Of this amount 47,023,244 gallons were used in refining operations conducted either on the premises or at directly affiliated plants. A total of 275,421,317 gallons was used by the producers; almost all of this—269,938,188 gallons to be exact—was burned in open-hearth furnaces or in other affiliated works; 3,405,506 gallons were consumed as fuel under boilers, and 2,077,623 were used otherwise.

The sales in 1930 amounted to 314,865,294 gallons, of which 290,458,213 were sold for refining into tar products and 24,407,081 were disposed of as fuel.

TABLE 78.—*Coke-oven tar produced and sold in the United States in 1930, by States* [1]

State	Sold				
	For use as fuel (gallons)	For refining into tar products (gallons)	Total sold (gallons)	Value	
				Total	Average
Alabama	(2)	(2)	31, 236, 158	$1, 639, 624	$0. 052
Colorado	----------	1, 163	1, 163	(3)	(3)
Illinois	----------	33, 329, 277	33, 329, 277	1, 662, 087	. 050
Indiana	----------	17, 494, 205	17, 494, 205	656, 476	. 038
Maryland	----------	11, 651, 235	11, 651, 235	(3)	(3)
Massachusetts	639, 195	9, 407, 602	10, 046, 797	554, 063	. 055
Michigan	----------	18, 435, 583	18, 435, 583	878, 332	. 048
Minnesota	----------	6, 220, 130	6, 220, 130	353, 265	. 057
New Jersey	----------	10, 228, 318	10, 228, 318	(3)	(3)
New York	(2)	(2)	40, 767, 941	2, 131, 723	. 052
Ohio	9, 061, 402	32, 044, 577	41, 105, 979	2, 022, 259	. 049
Pennsylvania	5, 137, 197	46, 239, 154	51, 376, 351	2, 298, 148	. 045
Tennessee	----------	886, 600	886, 600	45, 438	. 051
Utah	----------	4, 933, 619	4, 933, 619	(3)	(3)
Washington	----------	471, 655	471, 655	28, 299	. 060
West Virginia	----------	17, 784, 865	17, 784, 865	894, 860	. 050
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	----------	18, 895, 418	18, 895, 418	983, 744	. 052
Undistributed	9, 569, 287	62, 434, 812	----------	1, 414, 645	. 053
Total	24, 407, 081	290, 458, 213	314, 865, 294	15, 562, 963	. 049
From merchant ovens	639, 195	143, 407, 118	144, 046, 313	7, 469, 092	. 052
From furnace ovens	23, 767, 886	147, 051, 095	170, 818, 981	8, 093, 871	. 047

State	Used by producer (gallons)			On hand Dec. 31 (gallons)	Total produced (gallons)
	As fuel under boilers	In open-hearth or affiliated plants	Otherwise		
Alabama	177, 704	19, 159, 590	308, 087	3, 360, 910	49, 655, 324
Colorado	----------	5, 489, 554	44, 975	119, 000	5, 511, 136
Illinois	----------	5, 756, 432	55, 745	3, 800, 083	41, 629, 666
Indiana	----------	27, 859, 213	----------	3, 728, 255	46, 898, 884
Maryland	----------	20, 304	----------	835, 051	11, 546, 035
Massachusetts	----------	----------	----------	2, 193, 094	9, 825, 410
Michigan	----------	14, 577, 107	2, 523	2, 681, 154	33, 060, 596
Minnesota	----------	(3)	(3)	662, 704	8, 266, 310
New Jersey	----------	----------	----------	747, 382	10, 425, 336
New York	----------	(3)	977, 982	3, 535, 971	53, 153, 867
Ohio	(3)	49, 943, 187	----------	5, 688, 315	88, 124, 467
Pennsylvania	2, 769, 500	132, 259, 304	683, 720	8, 523, 047	197, 576, 541
Tennessee	----------	----------	----------	97, 714	867, 036
Utah	----------	----------	----------	62, 280	4, 830, 500
Washington	----------	----------	2, 378	16, 204	462, 443
West Virginia	(3)	3, 789, 607	----------	1, 185, 166	22, 209, 529
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	----------	----------	(3)	1, 187, 574	18, 442, 849
Undistributed	458, 302	11, 083, 890	2, 213	----------	----------
Total	3, 405, 506	269, 938, 188	2, 077, 623	38, 423, 904	602, 485, 929
From merchant ovens	----------	----------	981, 305	11, 828, 096	146, 286, 368
From furnace ovens	3, 405, 506	269, 938, 188	1, 096, 318	26, 595, 808	456, 199, 561

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[1] This table excluded the quantity of tar "refined at plant," which in 1930 amounted to 47,023,244 gallons.

[2] A small quantity of tar used as fuel is included with that refined into tar products.

[3] Included under "Undistributed."

TABLE 79.—*Production of coal-tar crudes by firms not primarily engaged in the operation of coke-oven plants and gas houses, 1930*

[Compiled by U. S. Tariff Commission]

Crude material	1930	
	Quantity	Value
Anthracene, crude (less than 30 per cent)........pounds..	(1)	(1)
Anthracene oil........gallons..	(1)	(1)
Benzene (benzol)........do....	(1)	(1)
Carbolic oil or middle oil........do....	(1)	(1)
Cresol or cresylic acid, crude........do....	(1)	(1)
Dead or creosote oil:		
Distillate as such........do....	96,891,940	$11,052,104
Distillate in coal-tar solution........do....	29,772,663	3,274,993
Light oil........do....	8,892,108	750,375
Motor fuel........do....	(1)	(1)
Naphthalene, crude........pounds..	18,616,792	304,574
Other distillates........gallons..	4,663,052	638,142
Pitch of tar........tons..	501,392	6,927,400
Pseudocumene........gallons..	(1)	(1)
Pyridine........do....	(1)	(1)
Refined tars........barrels..	2,565,292	11,293,996
Solvent naphtha........gallons..	(1)	(1)
Toluene (toluol)........do....	(1)	(1)
Xylene (xylol)........do....	(1)	(1)
Total crudes produced by tar distillates........	....	35,956,481

[1] Figures included in total but not published separately to avoid disclosing individual operations.

The trend of the relative quantities used and sold is shown by Tables 80 and 81. From 24.0 per cent in 1918 the proportion used by the producer has increased to 47.7 per cent in 1930. On the other hand, the proportion sold has fallen from 76.0 per cent in 1918 to 52.3 per cent in 1930, and, as already pointed out, part of the sales went for purposes other than distillation into refined products. These changes are striking evidence that the volume of tar now produced much exceeds the demand for distillation. More than half of the present output is disposed of as fuel, its price being determined essentially by the competitive price of fuel oil.

TABLE 80.—*Disposal of coke-oven tar produced in the United States, 1929 and 1930, in gallons*

	Furnace plants	Other plants	Total
1929			
Sold:			
For use as fuel........	47,157,284	1,331,383	48,488,667
For refining into tar products........	151,484,796	133,584,038	285,068,834
Used by producer:			
As fuel under boilers........	4,101,803	....	4,101,803
In open-hearth or other metallurgical plants........	293,948,414	....	293,948,414
Refined at plant........	39,004,433	4,014,591	43,019,024
1930			
Sold:			
For use as fuel........	23,767,886	639,195	24,407,081
For refining into tar products........	147,051,095	143,407,118	290,458,213
Used by producer:			
As fuel under boilers........	3,405,506	....	3,405,506
In open-hearth or other metallurgical plants........	269,938,188	....	269,938,188
Refined at plant........	42,746,711	4,276,533	47,023,244

TABLE 81.—*Per cent of coke-oven tar sold and per cent used by the producer, 1918–1930* [1]

Year	Sold	Used by producer	Year	Sold	Used by producer
1918	76.0	24.0	1925	49.9	50.1
1919	75.4	24.6	1926	52.4	47.6
1920	48.3	51.7	1927	55.9	44.1
1921	53.5	46.5	1928	52.6	47.4
1922	49.5	50.5	1929	49.0	51.0
1923	48.0	52.0	1930	52.3	47.7
1924	49.7	50.3			

[1] Not all the tar sold is taken by tar distillers. Of the 52.3 per cent sold in 1930 about 48.2 per cent went for refining into tar products and 4.1 per cent for use as fuel. Although no division of sales is available prior to 1929, it is clear that for some years a considerable proportion of the sales has gone for use as fuel.

The yield of coke-oven tar per ton of coal charged varies widely, depending partly upon the character of the coal charged. Table 82 shows the yield in each State for the last seven years.

TABLE 82.—*Average yield of coke-oven tar, by States, 1924–1930*

[Figures represent gallons per ton of coal charged]

State	1924	1925	1926	1927	1928	1929	1930	Average for 7 years shown
Alabama	8.2	8.4	8.7	9.0	9.3	9.1	8.83	8.79
Colorado	9.5	10.4	10.7	10.5	9.8	9.7	9.97	10.08
Illinois	7.9	7.9	7.7	8.3	8.2	7.6	8.09	7.96
Indiana	6.1	5.9	5.8	6.1	6.2	6.0	6.80	6.13
Maryland	6.8	6.9	6.5	6.8	7.6	7.5	7.09	7.03
Massachusetts	8.3	7.5	8.9	9.2	9.0	8.2	7.96	8.44
Michigan	7.6	7.4	7.3	7.5	8.2	8.2	8.96	7.88
Minnesota	8.4	8.0	7.3	7.0	7.2	8.0	8.82	7.82
New Jersey	8.4	8.1	8.0	7.8	8.2	8.1	8.16	8.11
New York	8.7	8.6	8.8	9.0	9.1	9.0	9.55	8.96
Ohio	9.0	9.1	8.6	8.8	8.9	8.8	9.68	8.98
Pennsylvania	9.9	9.3	9.4	9.7	10.5	10.7	10.52	10.00
Tennessee	8.9	8.2	7.5	7.4	7.4	6.8	6.30	7.50
Utah	10.4	11.3	11.4	12.0	11.7	11.8	11.66	11.47
Washington	8.2	8.1	7.9	7.5	7.9	8.3	7.73	7.95
West Virginia	11.3	10.2	10.1	10.0	10.5	10.1	10.47	10.38
Connecticut,[1] Kentucky, Missouri, Rhode Island, and Wisconsin	8.3	8.0	7.2	8.2	7.8	7.5	7.83	7.83
United States	8.6	8.4	8.3	8.6	9.0	8.9	9.20	8.71

[1] 1928 first year of production.

ADDITIONAL SUPPLIES FROM GAS WORKS

Further contributions to the supply of coal-tar crudes come from the carbonization of coal at city gas works. The few instances in which the gas company operates a complete refinery are covered by the Tariff Commission. Arrangements have been made to obtain information on gas works either through the Bureau of Mines or the Census Bureau, and the résumé of production of coal-tar crudes from all sources in Table 103 includes an allowance for this source as well.

TABLE 83.—*Production and sales of coke-oven, coal-gas, water-gas, and oil-gas tar in the United States, 1918–1930*

	Coke-oven tar [1]	Coal-gas tar [2]	Total coal tar	Water and oil gas tar
Production (gallons):				
1918	263,299,470	52,694,826	315,994,296	100,985,156
1919	288,901,739	53,146,421	342,048,160	[3] 105,318,339
1920	360,664,124	51,264,956	411,929,080	116,073,907
1921	253,051,649	(4)	309,051,649	(5)
1922	327,779,734	48,082,228	375,861,962	104,555,028
1923	440,907,109	(4)	493,407,109	(5)
1924	422,074,326	(4)	475,074,326	(5)
1925	480,848,814	(4)	534,848,814	(5)
1926	529,486,374	(4)	583,486,374	(5)
1927	546,859,205	(4)	600,859.205	(5)
1928	631,844,767	(4)	688,344,767	(5)
1929	680,864,366	47,329,311	728,193,677	117,601,208
1930	602,485,929	(4)	647,485,929	(5)
Sales (gallons):				
1918	200,233,002	47,727,839	247,960,841	55,283,484
1919	217,707,157	49,307,852	267,015,009	[3] 58,557,947
1920	174,363,696	46,604,133	220,967,829	59,238,730
1921	135,293,047	51,976,307	187,269,354	[3] 53,432,945
1922	162,204,417	41,266,074	203,470,491	47,338,489
1923	211,739,469	47,840,512	259,579,081	[3] 49,990,820
1924	209,979,999	(4)	258,479,999	(5)
1925	240,160,986	49,175,979	289,336,965	[3] 61,471,124
1926	277,248,522	(4)	326,248,522	(5)
1927	305,898,176	51,266,279	357,164,455	[3] 83,479,339
1928	332,150,270	(4)	383,150,270	(5)
1929	333,557,501	45,495,026	379,052,527	[3] 75,545,630
1930	314,865,294	(4)	357,865,294	(5)
Value of sales:				
1918	$6,364,972	$1,863,580	$8,228,552	$1,805,865
1919	6,918,549	2,156,471	9,075,020	[3] 2,012,723
1920	6,378,040	2,010,186	8,388,226	2,109,388
1921	5,645,309	2,811,728	8,457,037	[3] 2,192,015
1922	6,419,743	1,955,950	8,375,693	1,879,490
1923	9.250,552	2,461,691	11,712,243	[3] 2,001,363
1924	9,623,520	(4)	12,293,520	(5)
1925	11,903,196	2,750,719	14,653,915	[3] 2,594,025
1926	14,103,760	(4)	16,803,760	(5)
1927	16,095,478	2,923,819	19,019,297	[3] 3,768,464
1928	17,544,797	(4)	20,454,797	(5)
1929	16,982,406	2,485,434	19,467,840	[3] 3,353,799
1930	15,562,963	(4)	17,927,963	(5)

[1] Includes tar produced in by-product coke ovens operated by city gas companies.

[2] The figures here given for coal-gas tar include only the operations of coal-gas retorts. For 1918, 1920, and 1922 they are taken from special studies by the U. S. Geological Survey. For 1919, 1921, 1923, 1925, 1927, and 1929 revised census figures are used, obtained by subtracting from the totals for the manufactured-gas industry, as published by the Census Bureau, the tar produced at by-product coke ovens operated by city gas companies.

[3] As reported by the Bureau of the Census.

[4] Estimate included in total.

[5] No data.

AMMONIA

The continued decline in the price of ammonium sulphate is a reflection of the profound changes occurring in the nitrogen market. Rapid development of the synthetic-nitrogen industry in Germany during the war and subsequently was the widely heralded event that inaugurated the present phase of intercommodity competition among nitrogen products. Unquestionably, 1930 was an eventful and critical period in the nitrogen industry. It was characterized by reorganization and consolidation within the Chilean industry; by attempts to control output, prices, and export quotas through the formation of an international cartel; by an increase in inventories which hastened price reductions; and by continuation of plant expansion and new construction in Europe and the United States.

Intercommodity competition within the nitrogen industry has been keener than ever, as shown by a few examples, as follows: Anhydrous ammonia and ammonia liquor are replacing cyanamide and other nitrogen carriers in mixed fertilizer; synthetic nitrate of soda is making rapid inroads in the field once dominated by Chilean nitrate of soda; calcium nitrate is favored in citrus culture in California; imports of urea into the United States are becoming significant now that the tariff has been removed; and ammonia oxidation continues to displace nitrate of soda in the chamber acid process.

Major developments in the United States nitrogen industry during 1930 were the announcement of a large expansion of the Hopewell works of the Atmospheric Nitrogen Corporation; completion of construction at the Belle works of the E. I. du Pont de Nemours & Co.; announcement of plans by Shell Chemical Co. for an 80-ton-per-day ammonia plant to be built in California; and the completion of the new plant of the Midland Ammonia Co. at Midland, Mich. Other developments were the removal of the import tariff on ammonium sulphate and urea, the greatly extended use of the superphosphate ammoniation process, and the increased consumption of synthetic nitrate of soda.

The relative position of the by-product and synthetic nitrogen in the United States since 1926 and the consumption trends are shown in Table 84.[12]

The rapid increase in synthetic-nitrogen output and capacity and a possible decline of exports as the competitve situation abroad becomes keener indicate that the United States is rapidly attaining nitrogen independence. By-product ammonium sulphate probably will continue as an important source of agricultural nitrogen and will have a large influence in setting nitrogen prices. This year it has touched a new low price for all time, averaging 1.6 cents per pound as sulphate or 6.4 cents a pound as ammonia (NH_3).

The effect of ammonium sulphate in increasing soil acidity is a factor in preventing its more complete utilization as agricultural nitrogen. Hence sodium nitrate (Chilean and synthetic), nitrate of lime, and urea continue to compete with ammonium sulphate in the agricultural nitrogen market.

TABLE 84.—*Nitrogen situation in the United States, 1926–1930, in short tons of net nitrogen*

Year	Production			Imports	Exports	Apparent consumption
	By-product	Synthetic	Total			
1926	142,000	12,800	154,800	203,200	45,000	313,000
1927	147,500	18,000	165,500	190,300	35,900	319,900
1928	164,500	27,000	191,500	266,600	25,500	432,600
1929 [a]	186,000	100,000	286,000	242,000	48,000	480,000
1930 [a]	161,500	140,000	301,500	180,000	32,000	449,500

[a] Partly estimated.

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[12] Compiled from data published in Chemical and Metallurgical Engineering, vol. 38, No. 1, January, 1931, p. 42, and from other data.

TABLE 85.—*Ammonia produced at coke-oven plants, by States, in 1930, in pounds*

State	Sulphate	Liquor (NH_3 content)	Sulphate equivalent of all forms	
			Total	Per ton of coal coked
Alabama	(1)	(1)	139, 504, 118	24. 82
Colorado	12, 562, 247		12, 562, 247	22. 73
Illinois	(1)	(1)	115, 427, 939	22. 44
Indiana	109, 798, 995	4, 547, 244	127, 987, 971	18. 55
Maryland	33, 037, 464		33, 037, 464	20. 28
Massachusetts	(1)	(1)	27, 740, 272	22. 48
Michigan	39, 469, 457	11, 503, 774	85, 484, 553	23. 16
Minnesota	20, 906, 606		20, 906, 606	22. 29
New Jersey	28, 023, 055		28, 023, 055	21. 94
New York	(1)	(1)	133, 157, 563	23. 92
Ohio	[2] 653, 757, 930	[2] 10, 926, 075	226, 360, 358	24. 87
Pennsylvania			471, 101, 872	25. 09
Tennessee	3, 164, 385		3, 164, 385	22. 98
Utah	11, 893, 828		11, 893, 828	28. 70
Washington		432, 498	1, 729, 992	28. 91
West Virginia	47, 474, 474		47, 474, 474	22. 38
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	25, 833, 939	6, 663, 464	52, 487, 795	22. 28
Undistributed	355, 997, 580	14, 958, 078		
Total	1, 341, 919, 960	49, 031, 133	1, 538, 044, 492	23. 47
From merchant ovens	243, 800, 139	37, 840, 089	395, 160, 495	23. 33
From furnace ovens	1, 098, 119, 821	11, 191, 044	1, 142, 883, 997	23. 53

[1] Included under "Undistributed."

[2] Figures for Ohio and Pennsylvania combined to avoid disclosing individual operations.

TABLE 86.—*Yield of ammonium sulphate equivalent reported by coke-oven plants in 1921, 1929, and 1930*

	1921	1929	1930
Total ammonium sulphate or equivalent recovered..pounds	657, 001, 003	1, 712, 427, 835	1, 538, 044, 492
Yield of sulphate per ton of coal coked:			
At plant reporting minimum average yield....do	3. 6	9. 8	4. 97
At plant reporting maximum average yield....do	30. 3	31. 4	29. 26
At average plant [1]....do	21. 9	23. 0	23. 51
Average yield for all coal coked [2]....do	22. 8	22. 3	23. 47
Total number of plants reporting recovery of ammonia	67	87	87
Number of plants recovering—			
Less than 10 pounds per ton of coal	2	1	1
10–14.9 pounds	2	1	
15–19.9 pounds	14	8	5
20–21.9 pounds	11	21	16
22–23.9 pounds	13	24	23
24–25.9 pounds	15	19	24
26–27.9 pounds	3	9	14
28–29.9 pounds	6	3	4
30 pounds or more	1	1	

[1] Sum of averages for all plants divided by number of plants.

[2] Total yield in sulphate equivalent divided by number of tons of coal carbonized.

TABLE 87.—*Average monthly prices of sulphate of ammonia per 100 pounds, 1915–1930*

[Quotations, 1915 and 1916, abstracted from Oil, Paint, and Drug Reporter, at New York; 1917–1930, from Steel, f. o. b. producers' works. Figures for 1914–1922 compiled by C. G. Atwater, of the Barrett Co.]

Month	1915	1916	1917	1918	1919.	1920	1921	1922
January	$2.71¼	$3.96½	$4.12	$5.03	$4.68	$4.00	$3.37½	$2.20
February	2.98¾	3.96¼	4.18	5.22½	4.50	4.00	3.12½	2.35
March	3.16	3.92½	(1)	5.40½	4.25	4.55	2.92½	2.60½
April	3.10⅝	3.68¾	(1)	5.46	4.00	4.55	2.57½	2.65
May	3.20	3.57½	4.72½	5.59½	3.80	4.55	2.45	2.67
June	3.22½	3.53	4.80	5.10	3.60	4.55	2.45	2.72
July	3.41	3.43½	4.90	4.50	3.40	4.55	2.35	2.82
August	3.53	3.58¾	4.90	4.50	3.53	4.80	2.00	2.82
September	3.37½	3.77½	4.92½	4.50	3.53	4.80	1.95	2.90
October	3.37½	4.02½	4.95	4.50	3.57	4.25	2.20	3.05
November	3.57	4.21¼	4.92½	4.50	3.78	3.75	2.20	3.07
December	3.93¾	4.32½	4.90	4.86	3.93	3.38	2.20	3.12
Average	3.30	3.83	4.73	4.93	3.88	4.31	2.48	2.75

Month	1923	1924	1925	1926	1927	1928	1929	1930[2]
January	$3.10	$2.72½	$2.67½	$2.82½	$2.50	$2.325	$2.30	$2.15
February	3.15⅝	2.72½	2.62½	2.72½	2.52½	2.325	2.30	2.15
March	3.19½	2.72½	2.52½	2.68½	2.52½	2.35	2.30	2.15
April	3.22½	2.65	2.52½	2.62½	2.50	2.35	2.30	2.05
May	3.21½	2.62½	2.42½	2.62½	2.42	2.35	2.25	2.15
June	3.13¾	2.57½	2.37½	2.50	2.42	2.20	2.22½	2.15
July	3.10	2.50	2.67½	2.47½	2.25	2.20	2.22½	2.10
August	3.07½	2.35	2.75	2.47½	2.25	2.20	2.22½	1.95
September	3.02½	2.50	2.80	2.47½	2.30	2.20	2.20	1.80
October	3.01¼	2.60	2.95	2.47½	2.32½	2.30	2.15½	1.85
November	2.93¾	2.65	2.85	2.47½	2.32½	2.30	2.10	1.90
December	2.76¼	2.67½	2.80	2.47½	2.32½	2.30	2.05	1.95
Average	3.08	2.61	2.66	2.57	2.39	2.28	2.22	2.03

[1] No market.

[2] Steel, Jan. 1, 1931, p. 324.

LIGHT OIL AND ITS DERIVATIVES

The outlet for light oil continues to be essentially that of supplying motor benzol for blending of automotive fuels. The demand apparently has not shrunk, although the necessity for benzol in fuel blends is less than a few years ago. This situation is the result both of the development of antiknock materials, particularly ethyl fluid, and of petroleum-refining methods that leave many of the antiknock constituents in the gasoline that were formerly eliminated in a desire to meet unnecessary and uneconomic specifications. It appears that the market for motor benzol will continue to absorb all of the surplus light-oil production above that relatively limited quantity needed in the chemical industry for the making of refined benzol, toluol, and solvent naphtha.

TABLE 88.—*Number of plants making light oil or derivatives, by States, 1929 and 1930*

State	1929				1930			
	Total making coke	Making crude light oil	Making any refined product	Making motor benzol	Total making coke	Making crude light oil	Making any refined product	Making motor benzol
Alabama	8	8	6	6	8	8	6	6
Colorado	1	1	1	1	1	1	1	1
Illinois	8	4	3	2	8	6	3	3
Indiana	7	4	4	4	7	4	4	4
Maryland	1	1	1	1	1	1	1	1
Massachusetts	3	--------	--------	--------	3	--------	--------	--------
Michigan	7	3	3	2	7	3	2	2
Minnesota	3	2	1	1	3	2	2	2
New Jersey	2	--------	--------	--------	2	--------	--------	--------
New York	9	7	6	6	9	7	6	6
Ohio	15	15	13	12	15	15	13	11
Pennsylvania	12	10	9	9	12	10	9	9
Tennessee	1	1	1	1	1	1	1	1
Utah	1	1	1	1	1	1	1	1
Washington	1	--------	--------	--------	1	--------	--------	--------
West Virginia	3	3	3	3	4	3	3	3
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	5	3	2	1	6	3	2	1
Total	87	63	54	50	89	65	54	51
At merchant plants	41	20	12	11	43	21	13	12
At furnace plants	46	43	42	39	46	44	41	39

TABLE 89.—*Crude light oil produced at coke-oven plants in the United States, 1930, by States, in gallons* [1]

State	Average yield per ton of coal coked	Produced	Refined on the premises	Total derived products obtained from refining operations
Alabama	3.0	16,881,471	15,664,088	12,998,772
Colorado	3.3	1,843,965	1,848,880	1,440,879
Illinois	2.4	11,820,533	6,171,961	4,944,913
Indiana	3.0	19,064,651	20,470,672	16,890,747
Maryland	3.0	4,880,000	4,880,000	4,021,073
New York	2.7	11,369,587	19,421,488	16,533,952
Ohio	3.2	29,233,675	26,919,325	21,174,194
Pennsylvania	3.4	60,390,612	59,914,347	52,293,477
Tennessee	2.4	330,831	319,187	272,412
Utah	4.1	1,697,200	1,697,200	1,356,400
West Virginia	3.1	6,298,738	6,242,962	5,227,874
Kentucky, Michigan, Minnesota, Missouri, and Wisconsin	2.6	14,514,689	9,778,144	8,278,134
Total	3.1	178,325,952	173,328,254	145,432,827
From merchant ovens	2.4	24,717,830	21,762,868	18,436,603
From furnace ovens	3.2	153,608,122	151,565,386	126,996,224

[1] In addition to the quantity refined on the premises a few plants reported the sale of crude light oil. The total quantity sold in 1930 was 9,941,904 gallons, valued at $983,540, or 9.9 cents per gallon.

TABLE 90.—*Production of motor fuel in the United States, 1918–1930, in gallons*

Year	Gasoline production of petroleum refineries	Natural gasoline (total production)	Benzol produced, all grades, including motor benzol		
			Coke ovens	Gas works, including oil and water gas	Tar refineries, etc.[1]
1918	3,570,000,000	283,000,000	44,805.000	[2] 5,633,000	3,015,000
1919	3,958,000,000	352,000,000	61,068,000	(3)	1,826,000
1920	4,883,000,000	385,000,000	72,994,000	[4] 502.000	876,000
1921	5,154,000,000	450,000,000	54,459,000	(5)	2,172,000
1922	6,202,000,000	506,000,000	70,112,000	(5)	775,000
1923	7,556,000,000	816,000,000	97,335,000	(5)	395,000
1924	8,960,000,000	934,000,000	91,904,000	(5)	630,000
1925	10,903,000,000	1,127,000,000	103,821,000	(5)	742,000
1926	12,589,000,000	1,363,000,000	112,489,000	(5)	377,000
1927	13,878,000,000	1,641,000,000	109,003,000	(5)	371,000
1928	15,832,000,000	1,814,000,000	124,504,000	(5)	474,000
1929	18,273,000,000	2,234,000,000	130,868,000	(5)	546,000
1930	18,154,164,000	2,210,502,000	121,760,616	(5)	(5)

[1] As reported to the U. S. Tariff Commission.
[2] Of this only 2,177,000 gallons was sold, the balance being returned to the gas.
[3] Data not available in comparable form.
[4] Quantity sold, used because of apparent double counting between production figures of crude and refined benzol.
[5] Can not be shown without disclosing individual returns.

Figures 26 and 27 show the trend of prices obtained for the various light-oil products over a series of years.

TABLE 91.—*Producers' price per gallon of pure benzol f. o. b. works and tank-wagon price of gasoline, 1926–1930, by months*

[Prices of benzol are those quoted by Steel; of tank-wagon gasoline, average for five cities computed by J. E. Pogue and published in Commerce Yearbook, 1931, vol. 1, p. 314]

Month	1926		1927		1928		1929		1930	
	Benzol	Gasoline	Benzol	Gasoline	Benzol	Gasoline	Benzol	Gasoline	Benzol[1]	Gasoline
January	$0.235	$0.154	$0.235	$0.171	$0.23	$0.142	$0.23	$0.149	$0.225	$0.128
February	.230	.159	.235	.168	.23	.142	.23	.138	.22	.120
March	.230	.164	.23	.159	.22	.142	.23	.131	.22	.115
April	.235	.169	.24	.149	.22	.142	.23	.136	.22	.120
May	.245	.182	.24	.149	.22	.144	.23	.139	.215	.123
June	.250	.186	.23	.145	.215	.144	.23	.144	.21	.119
July	.250	.186	.23	.146	.22	.144	.23	.146	.21	.126
August	.250	.186	.23	.143	.22	.154	.23	.143	.21	.122
September	.250	.186	.23	.142	.22	.154	.23	.138	.21	.114
October	.245	.178	.23	.142	.225	.154	.23	.136	.21	.105
November	.245	.174	.23	.142	.23	.153	.23	.133	.21	.105
December	.240	.174	.23	.142	.23	.150	.23	.131	.21	.104
Average	.242	.175	.233	.150	.223	.147	.23	.139	.214	.117

[1] Steel, Jan. 1, 1931, p. 324.

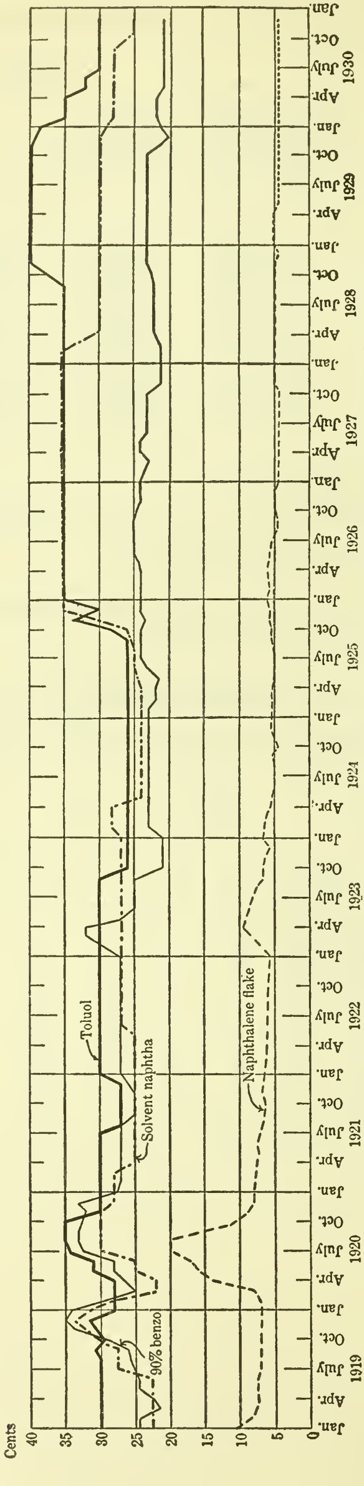

FIGURE 26.—Spot prices of 90 per cent benzol, toluol, solvent naphtha, and flake naphthalene in New York, 1919–1930

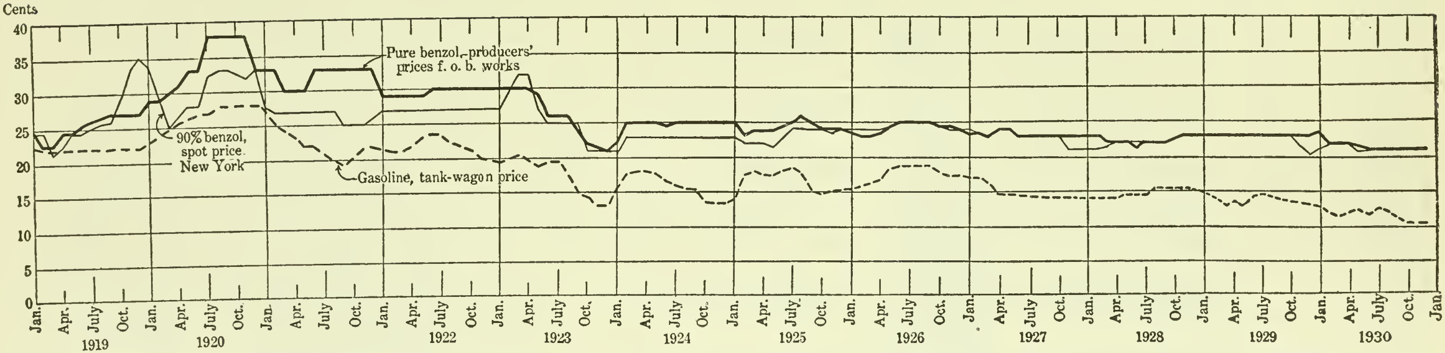

FIGURE 27.—Average price of 90 per cent benzol in New York, producer's price of pure benzol f. o. b. works, and tank-wagon price of gasoline, 1919–1930

TABLE 92.—*Monthly spot prices of coal-tar products in New York market, 1926–1930*

As quoted by Oil, Paint, and Drug Reporter. Figures are averages of high and low quotations for each month]

Month	Benzol (90 per cent), per gallon					Toluol, per gallon				
	1926	1927	1928	1929	1930	1926	1927	1928	1929	1930
January	$0.240	$0.240	$0.210	$0.230	$0.215	$0.350	$0.350	$0.350	$0.400	$0.375
February	.240	.235	.210	.230	.220	.350	.350	.350	.400	.350
March	.240	.230	.215	.230	.220	.350	.350	.350	.400	.350
April	.240	.240	.220	.230	.220	.350	.350	.350	.400	.350
May	.245	.240	.220	.230	.210	.350	.350	.350	.400	.325
June	.250	.230	.220	.230	.210	.350	.350	.350	.400	.325
July	.250	.230	.220	.230	.210	.350	.350	.350	.400	.300
August	.250	.230	.220	.230	.210	.350	.350	.350	.400	.300
September	.250	.230	.220	.230	.210	.350	.350	.350	.400	.300
October	.245	.230	.225	.230	.210	.350	.350	.375	.400	.300
November	.240	.210	.230	.215	.210	.350	.350	.400	.400	.300
December	.240	.210	.230	.205	.210	.350	.350	.400	.400	.300
Average	.244	.230	.220	.227	.215	.350	.350	.375	.400	.350

Month	Solvent naphtha, per gallon					Naphthalene flakes, per pound				
	1926	1927	1928	1929	1930	1926	1927	1928	1929	1930
January	$0.350	$0.350	$0.350	$0.300	$0.290	$0.061	$0.045	$0.050	$0.050	$0.045
February	.350	.350	.350	.300	.280	.058	.045	.050	.050	.045
March	.350	.350	.325	.300	.280	.060	.045	.050	.050	.045
April	.350	.350	.300	.300	.280	.060	.045	.050	.050	.045
May	.350	.350	.300	.300	.280	.059	.045	.050	.045	.045
June	.350	.350	.300	.300	.280	.058	.045	.050	.045	.045
July	.350	.350	.300	.300	.280	.053	.045	.050	.045	.045
August	.350	.350	.300	.300	.280	.048	.045	.050	.045	.045
September	.350	.350	.300	.300	.280	.048	.045	.050	.045	.045
October	.350	.350	.300	.300	.265	.050	.048	.050	.045	.045
November	.350	.350	.300	.300	.250	.050	.050	.048	.045	.045
December	.350	.350	.300	.300	.250	.050	.050	.045	.045	.045
Average	.350	.350	.325	.300	.275	.055	.046	.048	.047	.045

COKE-OVEN GAS

As gas is now the most valuable coke-oven by-product (fig. 25) it is given special attention in the following tables. Tables 93 to 95 give details of the quantities recovered, used, and sold in 1930, by States. Table 96 traces the disposition of the surplus gas from year to year. (See also fig. 28.) In the period since 1923 there has been a decrease in the amount of gas used for boiler and coke-oven fuel and a remarkable increase in that used in open-hearth furnaces or other affiliated works and in that distributed through city mains. It is apparent that the steel industry properly regards coke-oven gas as especially advantageous for use in specialized heat-treating processes, while the low-B. t. u. blast-furnace gas is used in a highly efficient manner in connection with oven heating. The advantages possible by this interchange of gases are becoming more and more appreciated. More than one-third of the total new tonnage built in the country in 1930 will be underfired with blast-furnace gas or with producer gas made from small coke and coke breeze.[13]

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[13] Ramsburg, C. T., Coke Ovens in the Steel Industry: Blast Furnace and Steel Plant, January, 1931, p. 108.

The increased disposal of coke-oven gas in steel plants and city mains is made possible by the utilization of lean gases, either manufactured cheaply or obtained as by-products, such as producer gas, blue water gas, or blast-furnace gas. (See Table 98 and fig. 29.) The calorific power of these substitute gases is as follows: Producer gas, 130 B. t. u.; blue water gas, 300 B. t. u.; and blast-furnace gas, 94 B. t. u. To record the progress made in this development the bureau has collected statistics of gases used for underfiring the ovens, the results of which are shown in Table 97. Of 89 by-product plants operating in 1930, 26 reported the use of producer gas, 4 of blue water gas, and 3 of blast-furnace gas, either alone or in combination. Most of these plants continued to use oven gas for at least a portion of the time. The total quantity of producer gas

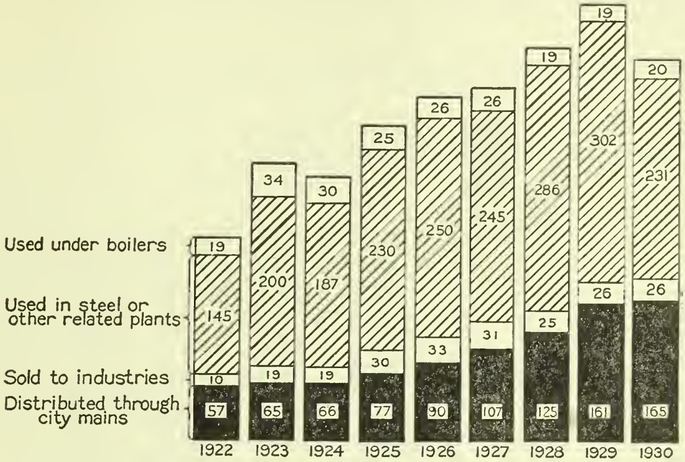

FIGURE 28.—Disposition of surplus coke-oven gas, 1922–1930. Gas used in heating ovens or wasted is not included. Figures in bars represent billion cubic feet

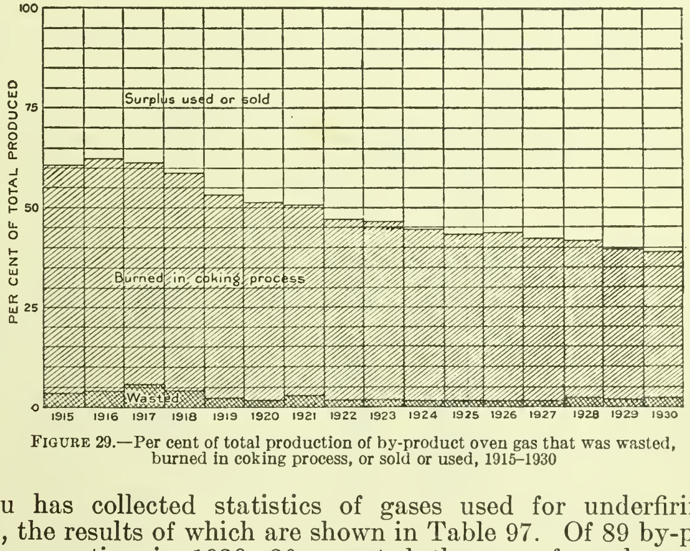

FIGURE 29.—Per cent of total production of by-product oven gas that was wasted, burned in coking process, or sold or used, 1915–1930

fired was 94,847,822 M cubic feet; of blue water gas, 2,130,113 M cubic feet; and of blast-furnace gas, 37,079,642 M cubic feet.

The use of blast-furnace gas has increased greatly, the consumption rising from 3,948,393 M cubic feet in 1928 to 37,079,642 M cubic feet in 1930.

TABLE 93.—*Coke-oven gas produced and sold in the United States in 1930, by States*

State	Number of active plants	Produced (M cubic feet)	Used in heating ovens (M cubic feet)	Surplus sold or used			Wasted (M cubic feet)
				M cubic feet	Value		
					Total	Average	
Alabama	8	63, 492, 663	28, 720, 312	32, 253, 125	$2, 414, 303	$0. 075	2, 519, 226
Colorado	1	6, 581, 525	2, 700, 549	3, 834, 868	(1)	(1)	46, 108
Illinois	8	53, 448, 586	13, 274, 730	40, 094, 006	8, 708, 987	. 217	79, 850
Indiana	7	75, 275, 137	33, 873, 406	40, 479, 335	8, 356, 508	. 206	922, 396
Maryland	1	17, 580, 187	6, 043, 551	11, 536, 636	(1)	(1)	----------
Massachusetts	3	11, 614, 790	2, 399, 433	9, 161, 290	3, 318, 706	. 362	54, 067
Michigan	7	42, 785, 166	13, 790, 952	28, 981, 656	7, 266, 522	. 251	12, 558
Minnesota	3	10, 829, 879	4, 987, 201	5, 794, 131	1, 795, 913	. 310	48, 547
New Jersey	2	15, 250, 804	3, 315, 660	11, 935, 144	(1)	(1)	----------
New York	9	61, 107, 119	13, 907, 723	45, 788, 265	14, 076, 605	. 307	1, 411, 131
Ohio	15	99, 167, 396	41, 010, 011	56, 336, 512	6, 534, 759	. 116	1, 820, 873
Pennsylvania	12	211, 603, 231	84, 449, 404	118, 909, 355	14, 133, 408	. 119	8, 244, 472
Tennessee	1	1, 300, 213	582, 634	717, 579	202, 928	. 283	----------
Utah	1	4, 557, 937	1, 914, 333	2, 049, 038	(1)	(1)	594, 566
Washington	1	714, 030	------------	656, 925	200, 599	. 305	57, 105
West Virginia	4	22, 547, 035	8, 431, 005	13, 780, 626	1, 359, 618	. 099	335, 454
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	6	26, 247, 256	6, 249, 350	19, 809, 837	5, 639, 582	. 285	188, 069
Undistributed	-------	-----------	-----------	-----------	5, 285, 699	. 180	----------
Total	89	724, 103, 004	265, 650, 254	442, 118, 328	79, 294, 137	. 179	16, 334, 422
From merchant ovens	43	186, 523, 530	42, 447, 643	141, 336, 608	42, 624, 010	. 302	2, 739, 279
From furnace ovens	46	537, 579, 474	223, 202, 611	300, 781, 720	36, 670, 127	. 122	13, 595, 143

[1] Included under "Undistributed."

TABLE 94.—*Disposition of surplus coke-oven gas in the United States in 1930, by States*

State	Used by producer					
	Under boilers			In steel or other affiliated plants		
	M cubic feet	Value		M cubic feet	Value	
		Total	Average		Total	Average
Alabama	7, 790, 111	$347, 236	$0. 045	18, 715, 151	$1, 241, 027	$0. 66
Colorado	----------	----------	----------	3, 834, 868	(1)	(1)
Illinois	(1)	(1)	(1)	2, 863, 526	486, 779	. 170
Indiana	398, 789	35, 473	. 089	29, 769, 940	4, 173, 208	. 140
Maryland	----------	----------	----------	4, 895, 856	(1)	(1)
Massachusetts	----------	----------	----------	----------	----------	----------
Michigan	(1)	(1)	(1)	(1)	(1)	(1)
Minnesota	627, 440	53, 886	. 086	(1)	(1)	(1)
New Jersey	----------	----------	----------	----------	----------	----------
New York	1, 366, 652	95, 157	. 070	12, 002, 540	1, 252, 317	. 104
Ohio	2, 340, 175	168, 374	. 072	41, 398, 769	4, 525, 294	. 109
Pennsylvania	3, 006, 220	210, 005	. 070	96, 892, 005	8, 668, 083	. 089
Tennessee	91, 100	3, 358	. 037	----------	----------	----------
Utah	1, 807, 225	(1)	(1)	----------	----------	----------
Washington	2, 277	1, 721	. 756	----------	----------	----------
West Virginia	983, 034	49, 349	. 050	10, 746, 020	833, 228	. 078
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	(1)	(1)	(1)	----------	----------	----------
Undistributed	1, 995, 636	220, 856	----------	10, 113, 877	3, 723, 970	----------
Total	20, 408, 659	1, 185, 415	. 058	231, 232, 552	24, 903, 906	. 108
From merchant ovens	7, 150, 686	366, 116	. 051	1, 298, 961	185, 207	. 143
From furnace ovens	13, 257, 973	819, 299	. 062	229, 933, 591	24, 718, 699	. 108

[1] Included under "Undistributed."

TABLE 94.—*Disposition of surplus coke-oven gas in the United States in 1930, by States*—Continued

State	Distributed through city mains			Sold for industrial purposes		
	M cubic feet	Value		M cubic feet	Value	
		Total	Average		Total	Average
Alabama	2,827,965	$424,911	$0.150	2,919,898	$401,129	$0.137
Colorado	----------	----------	----------	----------	----------	----------
Illinois	37,019,928	8,173,416	.221	(1)	(1)	(1)
Indiana	6,059,777	3,374,631	.557	4,250,829	773,196	.182
Maryland	6,640,780	(1)	(1)	----------	----------	----------
Massachusetts	9,113,289	3,306,706	.363	48,001	12,000	.250
Michigan	17,878,879	4,376,627	.245	(1)	(1)	(1)
Minnesota	4,292,668	1,613,332	.376	(1)	(1)	(1)
New Jersey	11,935,144	(1)	(1)	----------	----------	----------
New York	29,410,461	11,753,424	.400	3,008,612	975,707	.324
Ohio	4,688,137	1,018,389	.217	7,909,431	822,702	.104
Pennsylvania	16,289,989	4,834,202	.297	(1)	(1)	(1)
Tennessee	626,479	199,570	.318	----------	----------	----------
Utah	124,318	(1)	(1)	117,495	(1)	(1)
Washington	654,648	198,878	.304	----------	----------	----------
West Virginia	----------	----------	----------	(1)	(1)	(1)
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	17,127,265	5,330,584	.311	(1)	(1)	(1)
Undistributed	----------	4,334,082	----------	7,533,124	1,281,330	----------
Total	164,689,727	48,938,752	.297	25,787,390	4,266,064	.165
From merchant ovens	120,807,259	39,727,357	.329	12,079,702	2,345,330	.194
From furnace ovens	43,882,468	9,211,395	.210	13,707,688	1,920,734	.140

[1] Included under "Undistributed."

TABLE 95.—*Yield and disposal of gas and number of plants supplying gas for certain uses in 1930, by States*

State	Yield of gas (M cubic feet) per ton of coal coked	Disposal (per cent of total)						Number of plants	
		In coke plants		To steel or other affiliated plants	For distribution through city mains	For industrial purposes	Wasted	Supplying gas for city distribution	Supplying gas to steel or other affiliated plants
		For use in heating coke ovens	For use under boilers						
Alabama	11.3	45.2	12.3	29.4	4.5	4.6	4.0	3	6
Colorado	11.9	41.0	--------	58.3	--------	--------	.7	--------	1
Illinois	10.4	24.8	(1)	5.4	69.2	(1)	.2	8	4
Indiana	10.9	45.0	.5	39.6	8.1	5.6	1.2	5	4
Maryland	10.8	34.4	--------	27.8	37.8	--------	--------	1	1
Massachusetts	9.4	20.7	--------	--------	78.5	.4	.4	3	--------
Michigan	11.6	32.2	(1)	(1)	41.8	(1)	(2)	7	1
Minnesota	11.6	46.1	5.8	(1)	39.6	(1)	.4	2	1
New Jersey	11.9	21.7	--------	--------	78.3	--------	--------	2	--------
New York	11.0	22.8	2.2	19.7	48.1	4.9	2.3	8	4
Ohio	10.9	41.4	2.4	41.7	4.7	8.0	1.8	4	11
Pennsylvania	11.3	39.9	1.4	45.8	7.7	(1)	3.9	6	9
Tennessee	9.4	44.8	7.0	--------	48.2	--------	--------	1	--------
Utah	11.0	42.0	39.7	--------	2.7	2.6	13.0	1	--------
Washington	11.9	--------	.3	--------	91.7	--------	8.0	1	--------
West Virginia	10.6	37.4	4.4	47.6	--------	(1)	1.5	--------	2
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	11.1	23.8	(1)	--------	65.3	(1)	.7	5	--------
Total	11.1	36.7	2.8	31.9	22.7	3.6	2.3	57	44
From merchant ovens	11.0	22.7	3.8	0.7	64.8	6.5	1.5	37	6
From furnace ovens	11.1	41.5	2.5	42.8	8.2	2.5	2.5	20	38

[1] Not at liberty to publish.

[2] Less than one-tenth of 1 per cent

TABLE 96.—*Disposition of gas from by-product ovens in the United States, 1924–1930*

	Millions of cubic feet	Percentage of total production	Value	
			Total	Cents per M
1924				
Used under boilers	29,794	5.5	$1,729,013	5.8
Used in steel or other related plants	187,172	34.6	21,007,607	11.2
Distributed through city mains	65,677	12.1	23,486,416	35.8
Sold for industrial purposes	18,561	3.4	3,561,911	19.2
Total sold or used (not for ovens)	301,204	55.6	49,784,947	16.5
Used in heating ovens	229,298	42.4		
Wasted	10,599	2.0		
Total produced	541,101	100.0		
1925				
Used under boilers	25,239	3.9	1,451,253	5.8
Used in steel or other related plants	230,030	36.0	26,380,657	11.5
Distributed through city mains	77,457	12.1	29,319,309	37.9
Sold for industrial purposes	29,528	4.6	4,333,000	14.7
Total sold or used (not for ovens)	362,254	56.6	61,484,219	17.0
Used in heating ovens	266,112	41.6		
Wasted	11,278	1.8		
Total produced	639,644	100.0		
1926				
Used under boilers	25,954	3.7	1,438,699	5.5
Used in steel or other related plants	249,841	35.3	27,955,574	11.2
Distributed through city mains	89,566	12.7	29,978,997	33.5
Sold for industrial purposes	32,553	4.6	5,313,530	16.3
Total sold or used (not for ovens)	397,914	56.3	64,686,800	16.3
Used in heating ovens	296,431	42.0		
Wasted	12,337	1.7		
Total produced	706,682	100.0		
1927				
Used under boilers	25,849	3.7	1,866,342	7.2
Used in steel or other related plants	244,969	34.9	26,580,340	10.9
Distributed through city mains	106,910	15.2	36,249,081	33.9
Sold for industrial purposes	30,661	4.4	5,396,405	17.6
Total sold or used (not for ovens)	408,389	58.2	70,092,168	17.2
Used in heating ovens	280,771	40.1		
Wasted	11,735	1.7		
Total produced	700,895	100.0		
1928				
Used under boilers	18,620	2.4	1,132,547	6.1
Used in steel or other related plants	286,133	36.9	31,509,424	11.0
Distributed through city mains	125,132	16.1	39,935,641	31.9
Sold for industrial purposes	24,588	3.2	3,921,245	15.9
Total sold or used (not for ovens)	454,473	58.6	76,498,857	16.8
Used in heating ovens	302,748	39.0		
Wasted	18,292	2.4		
Total produced	775,513	100.0		
1929				
Used under boilers	18,507	2.2	1,282,327	6.9
Used in steel or other related plants	302,165	35.8	31,901,504	10.6
Distributed through city mains	160,561	19.1	46,994,632	29.3
Sold for industrial purposes	26,358	3.1	4,125,807	15.7
Total sold or used (not for ovens)	507,591	60.2	84,304,270	16.6
Used in heating ovens	316,800	37.6		
Wasted	18,757	2.2		
Total produced	843,148	100.0		
1930				
Used under boilers	20,409	2.8	1,185,415	5.8
Used in steel or other related plants	231,232	31.9	24,903,906	10.8
Distributed through city mains	164,690	22.7	48,938,752	29.7
Sold for industrial purposes	25,787	3.6	4,266,064	16.5
Total sold or used (not for ovens)	442,118	61.0	79,294,137	17.9
Used in heating ovens	265,650	36.7		
Wasted	16,335	2.3		
Total produced	724,103	100.0		

TABLE 97.—*Recapitulation of all gases used in heating by-product coke ovens, 1928–1930, in M cubic feet*

[Some plants using producer gas were unable to specify the exact amount. For these estimates have been supplied, assuming 130 B. t. u. per cubic foot of producer gas]

	Coke-oven gas	Producer gas	Blue water gas	Blast-furnace gas	Total
1928					
Number of plants using gas specified:					
Furnace plants	46	1	1	1	[1] 46
Other plants	33	17	4	1	[1] 39
Total	79	18	5	2	[1] 85
M cubic feet of gas used in heating ovens:					
Furnace plants	257, 542, 376	62, 652, 204	2, 391, 378	3, 948, 393	259, 615, 340
Other plants	45, 206, 152				112, 125, 163
Total	302, 748, 528	62, 652, 204	2, 391, 378	3, 948, 393	371, 740, 503
1929					
Number of plants using gas specified:					
Furnace plants	46	3	------------	1	[1] 46
Other plants	36	21	2	1	[1] 41
Total	82	24	2	2	87
M cubic feet of gas used in heating ovens:					
Furnace plants	269, 673, 413	5, 932, 110	------------	23, 933, 142	275, 994, 196
Other plants	47, 127, 209	84, 978, 563	2, 732, 883		158, 383, 124
Total	316, 800, 622	90, 910, 673	2, 732, 883	23, 933, 142	434, 377, 320
1930					
Number of plants using gas specified:					
Furnace plants	46	3	1	2	[1] 46
Other plants	38	23	3	1	[1] 43
Total	84	26	4	3	[1] 89
M cubic feet of gas used in heating ovens:					
Furnace plants	223, 202, 611	7, 933, 204	139, 325	37, 079, 642	399, 707, 831
Other plants	42, 447, 643	86, 914, 618	1, 990, 788		
Total	265, 650, 254	94, 847, 822	2, 130, 113	37, 079, 642	399, 707, 831

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[1] As some plants use a combination of one or more other gases with coke-oven gas, the net totals are less than the sum of the entries in the preceding columns.

TABLE 98.—*Disposition of gas from by-product coke ovens, 1915–1930, in per cent*

Year	Wasted	Burned in coking process	Surplus sold or used (not for ovens)	Year	Wasted	Burned in coking process	Surplus sold or used (not for ovens)
1915	3. 2	57. 3	39. 5	1923	2. 1	44. 9	53. 0
1916	4. 0	58. 4	37. 6	1924	2. 0	42. 4	55. 6
1917	5. 4	55. 7	38. 9	1925	1. 8	41. 6	56. 6
1918	4. 1	54. 8	41. 1	1926	1. 8	42. 0	56. 3
1919	2. 6	51. 0	46. 4	1927	1. 7	40. 1	58. 2
1920	2. 2	49. 5	48. 3	1928	2. 4	39. 0	58. 6
1921	2. 9	47. 4	49. 7	1929	2. 2	37. 6	60. 2
1922	1. 9	45. 9	52. 2	1930	2. 3	36. 7	61. 0

TABLE 99.—*Trend in prices of gas per M cubic feet, 1913–1930*

Year	Average price to householders [1]		Average value of all gas sold [2]		
	Manufactured gas (44 cities)	Natural gas (8 cities)	Natural gas [3]	Coal, oil, and water gas	Coke-oven surplus gas [4]
1913	$0.95	$0.34	$0.151	[5] $0.91	$0.088
1914	.94	.34	.159	([6])	.098
1915	.93	.34	.161	.91	.102
1916	.92	.34	.160	([6])	.098
1917	.91	.35	.179	.87	.087
1918	.95	.39	.213	.91	.087
1919	1.04	.44	.216	([6])	.086
1920	1.09	.44	.246	1.06	.140
1921	1.32	.49	.264	[7] 1.21	.168
1922	1.29	.54	.291	1.16	.167
1923	1.25	.55	.238	[7] 1.11	.162
1924	1.24	.62	.222	([6])	.165
1925	1.23	.68	.223	[7] 1.10	.170
1926	1.23	.69	.229	([6])	.163
1927	1.22	.69	.220	[7] 1.08	.172
1928	1.21	.69	.232	([6])	.168
1929	1.22	.69	.215	[7] 1.07	.166
1930	1.21	.69	.214	([6])	.156

[1] Average of prices in effect on or near June 15; from statistics of prices published by the Bureau of Labor Statistics. The figures for manufactured gas are the average net price per 1,000 cubic feet when 3,000 cubic feet is purchased, which amount the Bureau of Labor Statistics estimates to be the consumption of a typical family. Similarly the figures for natural gas are the average net price per 1,000 cubic feet when 5,000 cubic feet is purchased.

[2] As reported by operators to the Bureau of Mines.

[3] Average value of all natural gas at point of consumption or at town border when sold to local distributing company.

[4] Includes value of gas used by producer (not for ovens).

[5] Represents 1912.

[6] No report.

[7] Average value of all gas sold by city gas plants as reported by the Census of Manufactures, including coke-oven gas used for city distribution.

TABLE 100.—*Total sales of gas fuel in the United States, 1913–1930*

[Does not include producer gas, blast-furnace gas, Pintsch gas, or acetylene. Heating values used represent gross value]

Year	Quantity sold (billion cubic feet)				Rough equivalent in heating value (billion B. t. u.)			
	1 Surplus coke-oven gas	2 Coal, oil, and water gas	3 Natural gas, all uses	4 Total	5 Surplus coke-oven gas (1×550)	6 Coal, oil, and water gas (2×575)	7 Natural gas (3×1,075)	8 Total (5+6+7)
QUANTITY								
1913	64	[1] 166	582	812	35,200	95,450	626,000	756,650
1914	61	174	592	827	33,550	100,050	636,000	769,600
1915	84	[1] 182	629	895	46,200	104,650	676,000	826,850
1916	110	196	753	1,059	60,500	112,700	810,000	983,200
1917	131	[1] 211	795	1,137	72,050	121,325	855,000	1,048,375
1918	158	234	721	1,113	86,900	134,550	775,000	996,450
1919	193	[1] 248	746	1,187	106,150	142,600	802,000	1,050,750
1920	230	262	798	1,290	126,500	150,650	858,000	1,135,150
1921	154	[2] 269	662	1,085	84,700	154,675	712,000	951,375
1922	231	257	763	1,251	127,050	147,775	820,000	1,094,825
1923	318	[2] 258	1,007	1,583	174,900	148,350	1,082,000	1,405,250
1924	301	[3] 260	1,142	1,703	165,550	149,500	1,227,000	1,542,050
1925	362	[2] 283	1,189	1,834	199,100	162,725	1,278,175	1,640,000
1926	398	[3] 290	1,313	2,001	218,900	166,750	1,411,475	1,797,125
1927	408	300	1,445	2,153	224,400	172,500	1,553,375	1,950,275
1928	454	[3] 300	1,568	2,322	249,700	172,500	1,685,600	2,107,800
1929	508	[4] 277	1,917	[4] 2,702	279,400	[4] 159,000	2,060,800	[4] 2,499,200
1930	442	[3] 258	1,942	2,642	243,100	148,400	2,087,700	2,479,200

[1] Estimated by assuming a uniform rate of increase between successive years reported.

[2] Total sales of manufactured gas by city gas companies as reported by the Bureau of the Census minus gas purchased for mixing and resale minus sales of gas made in by-product ovens operated by city gas companies as determined by a special retabulation made by the Bureau of Mines in 1927.

[3] Estimated.

[4] Revised since last report. The figure given is the total production of coal, oil, and water gas as reported by the Bureau of the Census minus 7.5 per cent to allow for gas unaccounted for and used by producing company.

Table 100.—*Total sales of gas fuel in the United States, 1913–1930*—Continued

[Does not include producer gas, blast-furnace gas, Pintsch gas, or acetylene. Heating values used represent gross value]

Year	Quantity sold (billion cubic feet)				Rough equivalent in heating value (billion B. t. u.)			
	1 Surplus coke-oven gas	2 Coal, oil, and water gas	3 Natural gas, all uses	4 Total	5 Surplus coke-oven gas (1×550)	6 Coal, oil, and water gas (2×575)	7 Natural gas (3×1,075)	8 Total (5+6+7)
PER CENT								
1913	7.9	20.5	71.6	100.0	4.7	12.6	82.7	100.0
1914	7.4	21.0	71.6	100.0	4.4	13.0	82.6	100.0
1915	9.4	20.3	70.3	100.0	5.6	12.6	81.8	100.0
1916	10.4	18.5	71.1	100.0	6.2	11.5	82.3	100.0
1917	11.5	18.6	69.9	100.0	6.9	11.6	81.5	100.0
1918	14.2	21.0	64.8	100.0	8.7	13.5	77.8	100.0
1919	16.3	20.9	62.8	100.0	10.1	13.6	76.3	100.0
1920	17.8	20.3	61.9	100.0	11.1	13.3	75.6	100.0
1921	14.2	24.8	61.0	100.0	8.9	16.3	74.8	100.0
1922	18.5	20.5	61.0	100.0	11.6	13.5	74.9	100.0
1923	20.1	16.3	63.6	100.0	12.4	10.6	77.0	100.0
1924	17.7	15.3	67.0	100.0	10.7	9.7	79.6	100.0
1925	19.7	15.4	64.9	100.0	12.1	9.9	78.0	100.0
1926	19.9	14.5	65.6	100.0	12.2	9.3	78.5	100.0
1927	19.0	13.9	67.1	100.0	11.5	8.8	79.7	100.0
1928	19.5	12.9	67.6	100.0	11.9	8.2	79.9	100.0
1929	18.8	[4] 10.3	[4] 70.9	100.0	11.2	6.4	82.4	100.0
1930	16.7	9.8	73.5	100.0	9.8	6.0	84.2	100.0

[4] Revised since last report. The figure given is the total production of coal, oil, and water gas as reported by the Bureau of the Census minus 7.5 per cent to allow for gas unaccounted for and used by producing company.

CREOSOTE OIL AND PITCH

The addition of creosote oil to the list of by-products is the most striking development in by-product recovery during recent years. In 1928 coke operators reported a production of 12,386,000 gallons of creosote oil; in 1930 the production had risen to 25,679,882 gallons. Included in this total is the output of the tar refinery at the Clairton (Pa.) by-product plant. The carbolic oils, phenols, and cresylic acids of this plant are included in the statistics of the Tariff Commission, but the light-oil products and the creosote oil are included in the compilations of the Bureau of Mines. In addition to the Clairton plant 12 other by-product plants were producing creosote oil by fractional condensation in stills of a new continuous type.

The sales of creosote oil in 1930 amounted to 28,570,764 gallons, and the average price obtained was $0.088 per gallon.

The quantity of pitch produced in 1930 was 106,334 tons, of which most was mixed with virgin tar and burned about the plant as fuel. A total of 7,465 tons was reported as sold at an average price of $6.28 a ton.

PHENOL AND SULPHUR

Research in the utilization of waste materials has recently developed two other by-products, which were recovered in small amounts only in 1928 and 1929 but in considerably increased amounts in 1930.

Production of crude phenol, first recorded separately by the bureau in 1928 when 57,794 gallons were reported, rose to 84,683 gallons in 1929 and to 136,971 gallons in 1930.

The recovery of sulphur in the process of gas purification is another achievement in extending the list of by-products from the coke oven. Figures of production are not available; but the process is described by A. C. Fieldner in Report of Investigations 3079, Bureau of Mines, and reproduced in part in Coke and By-Products in 1929.

NAPHTHALENE

TABLE 101.—*Naphthalene sold by by-product coke operators, 1918–1930*

Year	Quantity (pounds)			Value	Average receipts per pound (cents)		Receipts per ton of coke (cents)
	Crude	Refined	Total		Crude	Refined	
1918	10,403,758	5,486,689	15,890,447	$650,229	2.8	6.6	2.5
1919	4,038,455	2,663,585	6,702,040	191,364	2.0	4.1	.8
1920	11,507,703	2,941,059	14,448,762	487,974	2.7	6.1	1.6
1921	1,652,466	331,057	1,983,523	59,335	2.5	5.6	.3
1922	3,298,851	1,589,084	4,887,935	131,252	1.6	5.0	.5
1923	10,047,427	1,198,206	11,245,633	239,699	1.7	5.5	.6
1924	7,891,116	327,957	8,219,073	128,208	1.5	3.6	.4
1925	9,692,185	208,332	9,900,517	97,493	3.6	2.5	.2
1926	7,556,372	166,851	7,723,223	97,310	1.3	(1)	.2
1927	7,848,224	----------	7,848,224	86,078	1.1	----------	.2
1928	[2] 10,937,429		10,937,429	135,693	[2] 1.2		.3
1929	[2] 19,659,367		19,659,367	320,272	[2] 1.6		.6
1930	[2] 13,028,904		13,028,904	161,264	[2] 1.2		.4

[1] Quantity sold too small to be representative.

[2] Crude and refined not separated.

TABLE 102.—*Total commercial production of naphthalene from all sources in the United States and imports, 1918–1930*

[Total sales are shown for coke plants and gas works to avoid double counting in production of crude and refined]

	By-product coke ovens; sales of crude and refined	City gas works; sales of crude and refined	Tar distilleries and all other establishments	Total commercial production
Quantity (pounds):				
1918	15,890,447	896,080	40,138,092	56,924,619
1919	6,702,040	(1)	12,612,203	20,114,243
1920	14,448,762	1,760,293	26,393,411	42,602,466
1921	1,983,523	(1)	16,949,464	19,432,987
1922	4,887,935	(1)	19,323,393	25,411,328
1923	11,245,633	1,115,563	41,453,002	53,814,198
1924	8,219,073	(1)	34,683,803	44,102,876
1925	9,900,517	1,266,037	34,135,175	45,301,729
1926	7,723,223	(1)	45,165,957	53,059,180
1927	7,848,224	(1)	45,298,441	53,176,665
1928	10,937,429	(1)	35,179,996	46,157,425
1929	19,659,367	(1)	19,501,679	39,201,046
1930	13,028,904	(1)	18,616,792	31,675,696
Value:				
1918	$650,229	$14,282	$1,281,440	$1,945,951
1919	191,364	(1)	327,201	542,565
1920	487,974	63,449	791,403	1,342,826
1921	59,335	(1)	380,167	462,502
1922	131,252	(1)	352,957	536,209
1923	239,699	42,247	652,148	934,094
1924	128,208	(1)	441,333	602,541
1925	97,493	34,751	519,773	652,017
1926	97,310	(1)	494,986	594,296
1927	86,078	(1)	470,806	557,884
1928	135,693	(1)	395,059	531,752
1929	320,272	(1)	366,491	687,763
1930	161,264	(1)	304,574	466,838

[1] Data lacking or incomplete. Estimate included in total.

TABLE 102.—*Total commercial production of naphthalene from all sources in the United States and imports, 1918–1930*—Continued

	Imports of crude (free) [2]	Imports of refined (dutiable) [2]	Total imports [2]	Total produced and imported	Average spot price of flake in New York (cents per pound)
Quantity (pounds):					
1918	3,902,731	2,795	3,905,526	60,830,145	
1919	3,239,256	7,650	3,246,906	23,361,149	
1920	15,012,096	3,697,562	18,709,658	61,312,124	
1921	4,495,806	441,685	4,937,491	24,370,478	
1922	3,144,332	75,680	3,220,012	28,631,340	
1923	20,992,439	9,605	21,002,044	74,816,242	
1924	5,266,708	4,549	5,271,257	49,374,133	
1925	1,979,612		1,979,612	47,281,341	
1926	6,962,719	424	6,963,143	60,022,323	
1927	6,576,500	18,668	6,595,168	59,771,833	
1928	19,926,289	27	19,926,316	66,083,741	
1929	35,007,419		35,007,419	74,208,465	
1930	27,666,834		27,666,834	59,342,530	
Value:					
1918	$130,098	$171	$130,269	$2,076,220	9.9
1919	92,265	384	92,649	635,214	7.6
1920	530,219	416,172	946,391	2,289,217	12.7
1921	135,943	31,458	167,401	629,903	7.2
1922	54,029	7,684	61,713	597,922	6.1
1923	575,563	194	575,757	1,509,851	7.5
1924	96,491	1,147	97,638	700,179	5.5
1925	26,593		26,593	678,610	5.4
1926	126,088	125	126,213	720,509	5.5
1927	131,436	3,077	134,513	692,397	4.6
1928	357,679	6	357,685	889,437	4.8
1929	598,718		598,718	1,286,481	4.7
1930	397,292		397,292	864,130	4.5

[2] Imports entered for consumption, compiled from records of the Bureau of Foreign and Domestic Commerce.

TOTAL PRODUCTION OF COAL-TAR CRUDES FROM ALL SOURCES

As explained (pp. 493 to 494) a number of the by-products of coke-oven operations are also produced at gas works or tar refineries. Table 103, prepared in collaboration with the Tariff Commission shows the total obtained from all sources.

TABLE 103.—*Total commercial production of benzol, toluol, solvent naphtha, naphthalene, and creosote oil from all sources in the United States, 1918–1930*

[Data for coke ovens and gas works from reports to U. S. Geological Survey and Bureau of Mines; for tar refineries and others from reports to U. S. Tariff Commission]

	By-product coke plants (sales) [1]	Gas works not elsewhere included (sales) [1 2]	Tar refineries and all other establishments [3] (production)	Total commercial production [4]
Benzol (all grades except motor benzol):				
Gallons—				
1918	43,441,980	2,177,168	3,015,848	48,634,996
1919	[5] 63,077,463	(6)	1,826,373	65,403,836
1920	17,230,776	(6)	875,561	18,141,337
1921	6,839,021	(6)	2,171,631	9,045,642
1922	12,256,348	(6)	774,940	13,071,288
1923	16,724,182	(6)	394,906	17,154,088
1924	17,740,608	(6)	629,934	18,417,542
1925	21,816,386	(6)	741,576	22,607,962
1926	21,987,790	(6)	377,048	22,374,838
1927	21,193,807	(6)	370,782	21,579,589
1928	21,452,973	(6)	474,457	21,942,430
1929	24,558,745	(6)	546,268	25,119,013
1930	19,187,627	(6)	(7)	19,918,059
Value—				
1918	$11,966,367	$572,950	$994,161	$13,533,478
1919	[5] 11,643,645	(6)	560,547	12,296,192
1920	4,497,823	(6)	287,586	4,794,409
1921	1,611,721	(6)	463,205	2,082,926
1922	3,435,381	(6)	215,136	3,664,517
1923	3,839,237	(6)	118,505	3,968,742
1924	3,736,656	(6)	155,973	3,901,629
1925	4,888,240	(6)	171,005	5,070,245
1926	5,067,693	(6)	105,513	5,175,206

See footnotes at end of table.

TABLE 103.—*Total commercial production of benzol, toluol, solvent naphtha, naphthalene, and creosote oil from all sources in the United States, 1918–1930*—Con.

	By-product coke plants (sales)[1]	Gas works not elsewhere included (sales)[1] [2]	Tar refineries and all other establishments[3] (production)	Total commercial production[4]
Benzol (all grades except motor benzol)—Con.				
Value—Continued.				
1927	$4,371,519	(6)	$100,453	$4,474,972
1928	4,215,752	(6)	111,805	4,330,557
1929	5,169,743	(6)	137,364	5,310,107
1930	3,377,026	(6)	(7)	3,544,929
Motor benzol:				
Gallons—				
1919 (included under benzol above)	----------	----------	(8)	(8)
1920	[9] 55,764,265	$467,126	(8)	(8)
1921	50,022,573	[10] 350,000	(8)	(8)
1922	54,930,203	(7)	(7)	55,622,482
1923	80,480,326	(6)	(7)	83,664,846
1924	72,921,244	(6)	(7)	76,072,771
1925	80,957,983	(6)	(7)	84,789,206
1926	89,501,212	(6)	(7)	92,891,995
1927	86,802,745	(6)	(7)	90,160,367
1928	102,935,995	(6)	(7)	106,574,289
1929	100,807,852	(6)	(7)	[11] 102,820,061
1930	102,572,989	(6)	(7)	104,036,569
Value—				
1919 (Included under benzol above)	----------	----------	(8)	(8)
1920	[9] $12,644,931	$112,849	(8)	(8)
1921	8,966,686	[10] 70,000	(8)	(8)
1922	10,491,309	(7)	(7)	$10,657,074
1923	13,145,833	(6)	(7)	13,851,704
1924	11,066,652	(6)	(7)	11,678,665
1925	13,441,422	(6)	(7)	14,270,746
1926	16,863,109	(6)	(7)	17,578,255
1927	14,629,999	(6)	(7)	15,201,144
1928	16,832,646	(6)	(7)	17,388,166
1929	16,063,285	(6)	(7)	[11] 16,408,442
1930	14,427,422	(6)	(7)	14,674,441
Toluol, all grades:				
Gallons—				
1918	8,541,366	3,965,518	1,596,353	14,103,237
1919	1,353,827	(6)	510,957	1,884,784
1920	2,470,364	[10] 2,000	(12)	(12)
1921	835,493	[10] 1,000	(12)	(12)
1922	1,910,060	(12)	(12)	(12)
1923	2,634,783	[10] 2,000	(12)	(12)
1924	3,231,502	[10] 2,000	(12)	(12)
1925	5,038,147	[10] 2,000	(12)	(12)
1926	8,650,605	[10] 200	(12)	(12)
1927	11,784,984	[10] 1,000	(12)	(12)
1928	16,181,650	[10] 1,000	(12)	(12)
1929	17,064,206	[10] 1,000	(12)	(12)
1930	12,083,423	[10] 1,000	(12)	(12)
Value—				
1918	$12,249,702	$5,597,353	$8,044,890	$25,891,945
1919	355,990	(6)	235,321	596,511
1920	740,722	[10] 300	(12)	(12)
1921	233,378	[10] 270	(12)	(12)
1922	557,015	(12)	(12)	(12)
1923	766,030	[10] 570	(12)	(12)
1924	769,682	[10] 500	(12)	(12)
1925	1,310,786	[10] 500	(12)	(12)
1926	2,914,752	[10] 170	(12)	(12)
1927	3,999,820	[10] 300	(12)	(12)
1928	5,513,624	[10] 300	(12)	(12)
1929	6,580,176	[10] 300	(12)	(12)
1930	3,613,778	[10] 300	(12)	(12)
Solvent naphtha, crude and refined, including xylol:				
Gallons—				
1918	3,284,037	1,442,267	965,458	5,691,762
1919	3,649,066	(6)	(7)	4,128,747
1920	4,695,464	(6)	(7)	5,384,560
1921	2,881,656	(6)	(7)	3,627,488
1922	2,861,482	(7)	(7)	3,680,811
1923	3,399,904	(6)	(7)	4,041,497
1924	3,884,585	(6)	812,378	4,781,963
1925	3,993,735	(6)	530,833	4,609,568
1926	3,546,117	(6)	(7)	4,588,844
1927	3,661,970	(6)	(7)	4,536,967
1928	4,471,141	(6)	(7)	5,615,192
1929	6,581,047	(6)	(7)	[11] 7,886,802
1930	5,539,537	(6)	(7)	6,698,623

See footnotes at end of table.

TABLE 103.—*Total commercial production of benzol, toluol, solvent naphtha, naphthalene, and creosote oil from all sources in the United States, 1918–1930*—Con.

	By-product coke plants (sales) [1]	Gas works not elsewhere included (sales) [1] [2]	Tar refineries and all other establishments [3] (production)	Total commercial production [4]
Solvent naphtha, crude and refined, including xylol—Continued.				
Value—				
1918	$458,689	$191,475	$232,003	$882,167
1919	557,416	(6)	(7)	672,685
1920	851,048	(6)	(7)	994,205
1921	510,509	(6)	(7)	644,548
1922	538,512	(7)	(7)	773,336
1923	608,084	(6)	(7)	800,698
1924	724,874	(6)	153,941	896,815
1925	805,251	(6)	148,801	972,052
1926	1,035,870	(6)	(7)	1,174,297
1927	926,787	(6)	(7)	1,072,198
1928	1,047,095	(6)	(7)	1,201,882
1929	1,591,333	(6)	(7)	[11] 1,771,119
1930	1,133,009	(6)	(7)	1,288,150
Naphthalene:				
Pounds—				
1918	15,890,447	896,080	40,138,092	56,924,619
1919	6,702,040	(6)	12,612,203	20,114,243
1920	14,448,762	1,760,293	26,393,411	42,602,466
1921	1,983,523	(6)	16,949,464	19,432,987
1922	4,887,935	(6)	19,323,393	25,411,328
1923	11,245,633	1,115,563	41,453,002	53,814,198
1924	8,219,073	(6)	34,683,803	44,102,878
1925	9,900,517	1,266,037	34,135,175	45,301,729
1926	7,723,223	(6)	45,165,957	53,059,180
1927	7,848,224	(6)	45,298,441	53,176,665
1928	10,937,429	(6)	35,179,996	46,157,425
1929	19,659,367	(6)	19,501,679	39,201,046
1930	13,028,904	(6)	18,616,792	31,675,696
Value—				
1918	$650,229	$14,282	$1,281,440	$1,945,951
1919	191,364	(6)	327,201	542,565
1920	487,974	63,449	791,403	1,342,826
1921	59,335	(6)	380,167	462,502
1922	131,252	(6)	352,957	536,209
1923	239,709	42,247	652,148	934,104
1924	128,208	(6)	441,333	602,541
1925	97,493	34,751	519,773	652,017
1926	97,310	(6)	494,986	594,296
1927	86,078	(6)	470,806	557,884
1928	135,693	(6)	395,059	531,752
1929	320,272	(6)	366,491	687,763
1930	161,264	(6)	304,574	466,838
Creosote oil,[13] including distillate as such and in coal-tar solution:				
Gallons—1928	[14] 12,386,000		122,074,126	134,460,126
1929	[11] 24,520,839		[11] 117,416,585	[11] 141,937,424
1930	25,679,882		126,664,603	152,344,485
Value—1928	(6)		$15,894,588	$17,507,588
1929	$2,566,092		[11] 14,670,697	[11] 17,236,789
1930	2,500,076		14,327,097	16,827,173

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[1] Sales instead of production are here given to avoid double counting between production of crude and pure grades and because such of the product as is used in the coke plant or gas works is not available for commercial use.

[2] In order to eliminate duplication, the figures for gas works are exclusive of by-product coke ovens operated by city gas companies, which are included in the preceding column, and exclusive of recoveries from such tar-refining operations conducted by the city gas companies as are included in the column headed "tar refineries." From time to time plants formerly included in the column headed "gas works" have been transferred to the column "tar refineries," hence the figures in the "gas works" column are not strictly comparable from year to year. The total commercial production shown in the last column contains no duplication and is comparable from year to year.

[3] See note 2.

[4] Totals include estimates for firms not reporting, and actual figures for items that can not be shown separately without disclosing individual returns.

[5] Includes motor benzol and 13,000 gallons of gasoline used in blending.

[6] Reports incomplete. Estimate included in total.

[7] Included in total, but can not be shown separately without disclosing individual returns.

[8] Data not collected from tar refiners prior to 1922.

[9] Includes 1,333,000 gallons of gasoline used in blending.

[10] Estimate.

[11] Revised since last report.

[12] A certain quantity of toluol was produced, but the figures can not be given without disclosing individual returns.

[13] Prior to 1928, all the creosote oil reported produced came from the "Tar refineries, etc." Beginning with 1928 considerable quantitites were recovered at by-product coke plants.

[14] Figures represent production.

BY-PRODUCT COKE OVENS OWNED BY CITY GAS COMPANIES, INCLUDED BY BUREAU OF THE CENSUS IN MANUFACTURED-GAS INDUSTRY

Reference has already been made (pp. 493 and 494) to the group of by-product coke plants installed by city gas companies, which the Bureau of the Census classifies as a part of the manufactured-gas industry and which the Bureau of Mines includes with the by-product coke industry.

The difference in classification is maintained by the two offices advisedly, in the interest of those who can use the statistics. For some purposes the census grouping is the more useful, and for others—particularly the design of ovens, technique of manufacture, and supply and demand for coal and coke—the grouping used by the Bureau of Mines is the more significant.

To compare or combine the two sets of figures, however, allowance must be made for the difference in classification, which can be done by means of the data in Table 104, prepared for the purpose by the Bureau of Mines. The table shows in parallel columns separate figures for the group of by-product coke plants operated by city gas companies (grouped by the Bureau of the Census with the manufactured-gas industry) and for all other by-product coke plants. Thus, in 1930 there were 22 plants in the group owned by city gas companies; and they produced 3,347,361 tons of coke, 58,518,792 M cubic feet of gas, 48,326,158 gallons of tar, 28,170,557 pounds of ammonia (NH_3 equivalent of all forms), and 3,205,687 gallons of crude light oil. Corresponding figures for each year from 1918 to 1925 are given in Coke and By-Products in 1925, pages 610 to 615, and for 1926 and 1927 in Coke and By-Products in 1927, page 683. By subtracting the production from the census figures for the manufactured-gas industry anyone interested may obtain the quantities of the several products produced by gas works proper; that is, coal, oil, and water-gas plants.

The table also shows the operations of the 67 plants not owned by city gas companies, which in 1930 produced 41,848,344 tons of coke, 665,584,212 M cubic feet of gas, 554,159,771 gallons of tar, 356,340,566 pounds of NH_3, and 175,120,265 gallons of crude light oil. This group of plants is that covered by the Census classification of "Coke, not including gas-house coke, made in by-product ovens." The figures are compiled by the Bureau of Mines from the reports of the coke producers and are accepted by the Bureau of the Census as its record of production in the years covered by the Census of Manufactures.

The totals for both groups of plants given in the last column of the table are the figures for the by-product coke industry as defined by the Bureau of Mines and given in the other tables of this report.

Both groups of by-product plants have been increasing in number and in volume of output. (See Table 105.) The number of public-utility plants rose from 9 in 1918 to 22 in 1930, and their sales of surplus gas increased in the same period from 7,450,191M to 50,226,236M cubic feet. At the same time, however, the sales of the plants not owned by city gas companies rose from 150,908,288M cubic feet in 1918 to 391,892,092M cubic feet, in 1930. The proportion of the total output of coke-oven gas contributed by the public-utility group was 11.4 per cent in 1930, as against 4.7 per cent in 1918.

TABLE 104.—*Production of coke, breeze, gas, and by-products at by-product coke plants owned by city gas companies (public utilities) and included by Bureau of the Census in manufactured-gas industry, and at all other by-product coke plants, 1929 and 1930*

Product	1929			1930		
	Plants not owned by city gas companies	Plants owned by city gas companies (public utilities)[1]	Total	Plants not owned by city gas companies	Plants owned by city gas companies (public utilities)[1]	Total
Number of active plants	66	21	87	67	22	89
Coke:						
Production……net tons	50, 179, 519	3, 232, 307	53, 411, 826	41, 848, 344	3, 347, 361	45, 195, 705
Value	$233, 994, 423	$22, 435, 745	$256, 430, 168	$177, 059, 474	$22, 564, 431	$199, 623, 905
Average value	$4. 46	$6. 94	$4. 80	$4. 23	$6. 74	$4. 42
Screenings and breeze:						
Production……net tons	4, 551, 255	301, 465	4, 852, 720	4, 000, 267	336, 845	4, 337, 112
Sales……do	907, 765	14, 928	922, 693	837, 744	3, 838	841, 582
Value	$2, 566, 386	$32, 392	$2, 598, 778	$2, 318, 212	$12, 804	$2, 331, 016
Average value	$2. 83	$2. 17	$2. 82	$2. 77	$3. 34	$2. 77
Coal charged into ovens:						
Quantity……net tons	71, 995, 373	4, 763, 585	76, 758, 958	60, 559, 470	4, 961, 851	65, 521, 321
Coke:						
Used by producer—						
Quantity……net tons	36, 287, 277	753, 964	37, 041, 241	28, 643, 611	831, 989	29, 475, 600
Value	$154, 596, 983	$5, 547, 059	$160, 144, 042	$121, 856, 140	$6, 047, 058	$127, 903, 198
Sales—						
Quantity……net tons	13, 542, 563	2, 463, 268	16, 005, 831	12, 168, 039	2, 291, 666	14, 459, 705
Value	$78, 162, 887	$16, 847, 228	$95, 010, 115	$68, 721, 472	$15, 137, 332	$83, 858, 804
By-products:						
Gas—						
Production……M cubic feet	787, 193, 562	55, 954, 527	843, 148, 089	665, 584, 212	58, 518, 792	724, 103, 004
Sales of surplus—						
Used under boilers—						
Quantity……M cubic feet	18, 480, 861	25, 641	18, 506, 502	20, 383, 891	24, 768	20, 408, 659
Value	$1, 277, 085	$5, 242	$1, 282, 327	$1, 180, 130	$5, 285	$1, 185, 415
Used in steel or affiliated plants—						
Quantity……M cubic feet	302, 079, 113	86, 352	302, 165, 465	230, 760, 545	472, 007	231, 232, 552
Value	$31, 879, 423	$22, 081	$31, 901, 504	$24, 813, 131	$90, 775	$24, 903, 906
Distributed through city mains—						
Quantity……M cubic feet	114, 913, 599	45, 647, 322	160, 560, 921	117, 249, 384	47, 440, 343	164, 689, 727
Value	$26, 299, 742	$20, 694, 890	$46, 994, 632	$29, 655, 463	$19, 283, 289	$48, 938, 752
Sold for industrial use—						
Quantity……M cubic feet	24, 250, 998	2, 106, 693	26, 357, 691	23, 498, 272	2, 289, 118	25, 787, 390
Value	$2, 920, 001	$1, 205, 806	$4, 125, 807	$3, 301, 518	$964, 546	$4, 266, 064
Tar—						
Production……gallons	636, 386, 413	44, 477, 953	680, 864, 366	554, 159, 771	48, 326, 158	602, 485, 929
Sales—						
Quantity……do	290, 903, 267	42, 654, 234	333, 557, 501	267, 307, 177	47, 558, 117	314, 865, 294
Value	$14, 651, 832	$2, 330, 574	$16, 982, 406	$13, 145, 309	$2, 417, 654	$15, 562, 963
Average value	$0. 050	$0. 055	$0. 051	$0. 049	$0. 051	$0. 049
Ammonia—						
Production (NH_3 equivalent of all forms)……pounds	401, 440, 953	26, 666, 005	428, 106, 958	356, 340, 566	28, 170, 557	384, 511, 123
Liquor (NH_3 equivalent)—						
Production……pounds	52, 302, 845	3, 725, 502	56, 028, 347	45, 310, 725	3, 720, 408	49, 031, 133
Sales……do	51, 762, 440	3, 708, 238	55, 470, 678	41, 713, 100	3, 655, 190	45, 368, 290
Value	$2, 687, 053	$133, 749	$2, 820, 802	$2, 105, 647	$130, 416	$2, 236, 063
Sulphate—						
Production……pounds	1, 396, 552, 434	91, 762, 013	1, 488, 314, 447	1, 244, 119, 364	97, 800, 596	1, 341, 919, 960
Sales……do	1, 350, 154, 009	83, 311, 583	1, 433, 465, 592	1, 215, 183, 826	95, 404, 496	1, 310, 588, 322
Value	$24, 174, 387	$1, 687, 092	$25, 861, 479	$18, 896, 958	$1, 551, 675	$20, 448, 633

[1] Includes all-by-product ovens built by city gas companies, some of which are operated in conjunction with coal, oil, and water gas plants. Does not include independent by-product plants which may sell gas to public-utility ocmpanies for distribution.

TABLE 104.—*Production of coke, breeze, gas, and by-products at by-product coke plants owned by city gas companies (public utilities) and included by Bureau of the Census in manufactured-gas industry, and at all other by-product coke plants, 1929 and 1930*—Continued

Product	1929			1930		
	Plants not owned by city gas companies	Plants owned by city gas companies (public utilities)	Total	Plants not owned by city gas companies	Plants owned by city gas companies (public utilities)	Total
By-products—Continued.						
Crude light oil—						
Production.....gallons..	198, 225, 478	2, 368, 549	200, 594, 027	175, 120, 265	3, 205, 687	178, 325, 952
Sales..............do....	10, 277, 234	813, 475	11, 090, 709	8, 249, 015	1, 692, 889	9, 941, 904
Value................	$1, 271, 335	$103, 192	$1, 374, 527	$818, 581	$164, 959	$983, 540
Light-oil derivatives—						
Production.....gallons..	161, 752, 018	1, 266, 067	163, 018, 085	144, 215, 469	1, 217, 358	145, 432, 827
Sales..............do....	149, 662, 155	1, 226, 871	150, 889, 026	140, 187, 172	1, 179, 438	141, 366, 610
Value................	$29, 283, 289	$246, 196	$29, 529, 485	$22, 455, 182	$216, 168	$22, 671, 350
Naphthalene, crude and refined—						
Production....pounds..	19, 684, 491	76, 891	19, 761, 382	12, 566, 302	73, 800	12, 640, 102
Sales..............do....	19, 582, 476	76, 891	19, 659, 367	12, 955, 104	73, 800	13, 028, 904
Value................	$319, 119	$1, 153	320, 272	$160, 674	$590	$161, 264
All other products, value..	$2, 422, 844	$59, 486	$2, 482, 330	$2, 682, 959	$52, 812	$2, 735, 771

TABLE 105.—*Summary of operations of by-product plants owned by city gas companies and of all other by-product coke plants, 1918–1930*

[The plants owned by city gas companies are included by the Bureau of the Census in the manufactured-gas industry]

Year	Plants not owned by city gas companies					Plants owned by city gas companies (public utilities)				
	Number of plants	Coke produced		Surplus gas [1]		Number of plants	Coke produced		Surplus gas [1]	
		Net tons	Per cent of total by-product coke	M cubic feet	Per cent of total surplus gas		Net tons	Per cent of total by-product coke	M cubic feet	Per cent of total surplus gas
1918.......	51	24, 919, 395	95. 9	150, 908, 288	95. 3	9	1, 078, 185	4. 1	7, 450, 191	4. 7
1919.......	56	23, 894, 658	95. 1	183, 468, 750	95. 1	9	1, 242, 963	4. 9	9, 355, 344	4. 9
1920.......	59	29, 637, 341	96. 1	221, 032, 497	95. 9	9	1, 196, 610	3. 9	9, 383, 422	4. 1
1921.......	60	19, 045, 898	96. 4	148, 166, 088	96. 0	7	703, 682	3. 6	6, 134, 910	4. 0
1922.......	57	27, 889, 475	97. 7	226, 152, 451	97. 7	7	661, 070	2. 3	5, 230, 567	2. 3
1923.......	58	36, 637, 455	97. 4	310, 789, 918	97. 6	7	960, 209	2. 6	7, 652, 336	2. 4
1924.......	60	33, 072, 640	97. 3	292, 368, 617	97. 1	11	910, 928	2. 7	8, 835, 236	2. 9
1925.......	61	38, 786, 990	97. 2	350, 178, 112	96. 7	13	1, 125, 169	2. 8	12, 076, 160	3. 3
1926.......	62	42, 894, 780	96. 7	381, 477, 264	95. 9	15	1, 481, 806	3. 3	16, 436, 824	4. 1
1927.......	62	41, 924, 796	95. 5	381, 306, 485	93. 4	17	1, 959, 930	4. 5	27, 082, 872	6. 6
1928.......	65	45, 568, 594	94. 3	414, 645, 183	91. 2	20	2, 744, 431	5. 7	39, 827, 389	8. 8
1929.......	66	50, 179, 519	93. 9	459, 724, 571	90. 6	21	3, 232, 307	6. 1	47, 866, 008	9. 4
1930.......	67	41, 848, 344	92. 6	391, 892, 092	88. 6	22	3, 347, 361	7. 4	50, 226, 236	11. 4

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[1] Surplus gas sold or used for purposes other than heating coke ovens, exclusive of a small amount wasted.

PRODUCTION OF COKE, 1880–1930, BY STATES

TABLE 106.—*Coke produced in the United States, 1880–1930, by States, in net tons*

Year	Alabama	Colorado	Connecticut	Georgia	Illinois	Indiana	Kansas	Kentucky	Maryland	Massachusetts	Michigan	Minnesota	Missouri	Montana	New Jersey	New Mexico
1880	60,781	25,568	----------	38,041	12,700	----------	3,070	4,250	----------	----------	----------	----------	----------	----------	----------	----------
1881	109,033	48,587	----------	41,376	14,800	----------	5,670	4,370	----------	----------	----------	----------	----------	----------	----------	----------
1882	152,940	102,105	----------	46,602	11,400	----------	6,080	4,070	----------	----------	----------	----------	----------	----------	----------	1,000
1883	217,531	133,997	----------	67,012	13,400	----------	8,430	5,025	----------	----------	----------	----------	----------	----------	----------	3,905
1884	244,009	115,719	----------	79,268	13,095	----------	7,190	2,223	----------	----------	----------	----------	----------	75	----------	18,282
1885	301,180	131,960	----------	70,669	10,350	----------	8,050	2,704	----------	----------	----------	----------	----------	175	----------	17,940
1886	375,054	142,797	----------	82,680	8,103	6,124	12,493	4,528	----------	----------	----------	----------	----------	----------	----------	10,236
1887	325,020	170,698	----------	79,241	9,198	17,658	14,950	14,565	----------	----------	----------	----------	2,970	7,200	----------	13,710
1888	508,511	179,682	----------	83,721	7,410	11,956	14,831	23,150	----------	----------	----------	----------	2,600	12,000	----------	8,540
1889	1,030,510	187,638	----------	94,727	11,583	8,301	13,910	13,021	----------	----------	----------	----------	5,275	14,043	----------	3,460
1890	1,072,942	245,756	----------	102,233	5,000	6,013	12,311	12,343	----------	----------	----------	----------	6,136	14,427	----------	2,050
1891	1,282,496	277,074	----------	103,057	5,200	3,798	14,174	33,777	----------	----------	----------	----------	6,872	29,009	----------	2,300
1892	1,501,571	[1] 373,229	----------	81,807	3,170	3,207	9,132	36,123	----------	----------	----------	----------	7,299	34,557	----------	----------
1893	1,168,085	[1] 362,986	----------	90,726	2,200	5,724	8,565	48,619	----------	----------	----------	----------	5,905	29,945	----------	5,803
1894	923,817	[1] 317,196	----------	93,029	2,200	6,551	8,439	29,748	----------	----------	----------	----------	2,250	17,388	----------	6,529
1895	1,444,339	[1] 340,357	----------	60,212	2,250	4,804	5,287	25,460	----------	----------	----------	----------	2,028	25,337	----------	14,663
1896	1,479,437	[1] 363,760	----------	53,673	2,600	4,353	4,785	27,107	----------	----------	----------	----------	2,500	60,078	----------	24,228
1897	1,443,017	[1] 342,653	----------	33,000	1,549	2,904	6,181	32,117	----------	----------	----------	----------	2,593	67,849	----------	1,438
1898	1,663,020	[1] 474,808	----------	49,529	2,325	1,825	4,180	22,242	----------	----------	----------	----------	740	52,009	----------	6,980
1899	1,787,809	[1] 530,424	----------	50,907	[2] 2,370	(2)	14,476	81,095	----------	(3)	----------	----------	2,860	56,376	----------	44,134
1900	2,110,837	[1] 618,755	----------	73,928	(4)	(4)	5,948	95,532	----------	(4)	(4)	----------	2,087	54,731	----------	44,774
1901	2,148,911	[1] 671,303	----------	54,550	(4)	(4)	7,138	100,285	----------	(4)	(4)	----------	4,749	57,004	----------	41,643
1902	2,552,246	[1] 1,003,393	----------	82,064	(4)	(4)	20,902	126,879	----------	(4)	(4)	----------	5,780	53,463	----------	23,296
1903	2,693,497	[1] 1,053,840	----------	85,546	(4)	(4)	14,194	115,362	(4)	(4)	(4)	----------	1,839	45,107	(4)	11,050
1904	2,340,219	[1] 789,060	----------	75,812	4,439	(4)	9,460	64,112	(4)	(4)	(4)	(4)	2,446	41,497	(4)	58,256
1905	2,576,986	[1] 1,378,824	----------	70,593	10,307	----------	4,425	79,487	(4)	(4)	(4)	(4)	1,580	31,482	(4)	89,638
1906	3,034,501	[1] 1,455,905	----------	70,280	268,693	----------	1,698	74,064	(4)	(4)	(4)	(4)	----------	38,182	(4)	147,747
1907	3,021,794	[1] 1,421,579	----------	74,934	372,697	----------	6,274	67,068	332,253	466,458	(4)	(4)	----------	40,714	256,057	265,125
1908	2,362,666	[1] 982,291	----------	39,422	362,182	(4)	2,497	37,827	270,916	453,883	(4)	(4)	----------	(4)	248,893	274,565
1909	3,085,824	[1] 1,251,805	----------	46,385	1,276,956	(4)	----------	46,371	315,587	444,349	(4)	(4)	----------	(4)	261,460	373,967
1910	3,249,027	[1] 1,346,211	----------	43,814	1,514,504	(4)	(4)	53,857	335,373	450,001	(4)	(4)	----------	(4)	250,153	401,646
1911	2,761,521	[1] 1,177,023	----------	37,553	1,610,212	(4)	(4)	66,099	343,451	477,564	(4)	(4)	----------	(4)	255,334	381,927
1912	2,975,489	972,941	----------	43,158	1,764,944	2,616,339	(4)	191,555	304,715	511,596	(4)	(4)	----------	----------	304,715	413,906
1913	3,323,664	879,461	----------	42,747	1,859,553	2,727,025	----------	317,084	236,423	531,384	(4)	(4)	----------	----------	255,792	467,945
1914	3,084,149	666,083	----------	24,517	1,425,168	2,276,652	----------	443,959	87,852	540,631	(4)	(4)	----------	----------	255,283	362,572
1915	3,071,811	670,938	----------	20,039	1,686,998	2,768,099	----------	526,097	313,283	504,438	(4)	127,847	(4)	----------	269,448	389,411
1916	4,298,417	1,053,553	----------	47,127	2,320,400	3,489,660	----------	802,526	489,982	563,048	(4)	431,319	(4)	----------	210,766	502,812

[1] Utah included with Colorado.

[2] Indiana included with Illinois.

[3] Included with Pennsylvania.

[4] Included under "Combined States."

TABLE 106.—*Coke produced in the United States, 1880–1930, by States, in net tons*—Continued

Year	Alabama	Colorado	Connecticut	Georgia	Illinois	Indiana	Kansas	Kentucky	Maryland	Massachusetts	Michigan	Minnesota	Missouri	Montana	New Jersey	New Mexico
1917	4,892,589	1,112,449	--------	39,589	2,289,833	3,540,718	--------	863,071	518,810	595,113	(4)	490,272	(4)	--------	423,361	577,679
1918	4,352,172	989,447	--------	22,048	2,285,610	3,898,215	--------	818,785	474,368	556,397	(4)	784,065	(4)	--------	682,148	597,072
1919	3,380,771	613,753	--------	18,149	1,703,903	3,702,180	--------	691,969	356,237	393,331	808,729	586,094	(4)	--------	788,465	260,162
1920	4,013,891	789,499	--------	16,523	2,136,793	4,553,697	--------	739,577	682,132	488,089	1,393,445	674,801	(4)	--------	725,571	(4)
1921	2,534,039	368,131	--------	6,943	1,322,178	3,091,263	--------	284,825	292,439	294,059	777,125	435,866	(4)	--------	739,768	(4)
1922	3,799,865	484,039	--------	8,832	1,982,906	3,995,505	--------	487,167	589,893	407,081	1,142,059	462,044	(4)	--------	790,811	87,631
1923	4,654,075	647,823	--------	12,556	3,187,168	5,042,614	--------	559,711	861,668	554,125	1,648,773	695,824	(4)	--------	897,569	(4)
1924	4,541,058	735,520	--------	8,081	2,355,474	4,272,435	--------	(4)	810,118	397,640	1,770,547	514,764	(4)	--------	869,120	83,070
1925	4,670,481	644,481	--------	4,925	3,011,497	5,141,940	--------	(4)	1,019,209	535,302	1,751,118	518,355	(4)	--------	903,997	(4)
1926	(4)	790,118	--------	3,059	3,336,962	5,990,344	--------	(4)	1,120,610	573,748	1,826,638	619,905	(4)	--------	913,250	(4)
1927	4,364,354	788,586	--------	(4)	3,013,940	5,549,762	--------	(4)	1,077,309	744,091	1,920,394	632,628	(4)	--------	906,321	--------
1928	4,327,324	750,022	(4)	(4)	3,240,964	6,094,201	--------	(4)	1,186,398	687,356	2,399,656	622,696	(4)	--------	903,177	--------
1929	4,753,967	721,457	(4)	--------	4,204,116	6,455,378	--------	(4)	1,393,052	776,679	2,679,971	746,004	(4)	--------	897,530	--------
1930	3,986,920	458,443	(4)	--------	3,576,577	4,984,620	--------	(4)	1,169,016	862,663	2,603,815	641,205	(4)	--------	918,814	--------

Year	New York	Ohio	Oklahoma (Indian Territory)	Pennsylvania	Rhode Island	Tennessee	Texas	Utah	Virginia	Washington	West Virginia	Wisconsin	Wyoming	Combined States	Total
1880	--------	100,596	1,546	2,821,384	--------	130,609	--------	1,000	--------	--------	138,755	--------	--------	--------	3,338,300
1881	--------	119,469	1,768	3,437,708	--------	143,853	--------	--------	--------	--------	187,126	--------	--------	--------	4,113,760
1882	--------	103,722	2,025	3,945,034	--------	187,695	--------	250	--------	--------	230,398	--------	--------	--------	4,793,321
1883	--------	87,834	2,573	4,438,464	--------	203,691	--------	--------	25,340	--------	257,519	--------	--------	--------	5,464,721
1884	--------	62,709	1,912	3,822,128	--------	219,723	--------	--------	63,600	400	223,472	--------	--------	--------	4,873,805
1885	--------	39,416	3,584	3,991,805	--------	218,842	--------	--------	49,139	311	260,571	--------	--------	--------	5,106,696
1886	--------	34,932	6,351	5,406,597	--------	368,139	--------	--------	122,352	825	264,158	--------	--------	--------	6,845,369
1887	--------	93,004	10,060	5,832,849	--------	396,979	--------	--------	166,947	14,625	442,031	--------	--------	--------	7,611,705
1888	--------	67,194	7,502	6,545,779	--------	385,693	--------	--------	149,199	--------	531,762	500	--------	--------	8,540,030
1889	--------	75,124	6,639	7,659,055	--------	359,710	--------	761	146,528	3,841	607,880	16,016	--------	--------	10,258,022
1890	--------	74,633	6,639	8,560,245	--------	348,728	--------	8,528	165,847	5,837	833,377	24,976	--------	--------	11,508,021
1891	--------	38,718	9,464	6,954,846	--------	364,318	--------	7,949	167,516	6,000	1,009,051	34,387	2,682	--------	10,352,688
1892	--------	51,818	3,569	8,327,612	--------	354,096	--------	(1)	147,912	7,177	1,034,750	33,800	--------	--------	12,010,829
1893	12,850	22,436	7,135	6,229,051	--------	265,777	--------	(1)	125,092	6,731	1,062,076	14,958	2,916	--------	9,477,580
1894	16,500	32,640	3,051	6,063,777	--------	292,646	--------	(1)	180,091	5,245	1,193,933	4,250	4,352	--------	9,203,632
1895	18,521	29,050	5,175	9,404,215	--------	396,790	286	(1)	244,738	15,129	1,285,206	4,972	4,895	--------	13,333,714
1896	(3)	80,868	21,021	[5] 7,356,502	--------	339,202	--------	(1)	268,081	25,949	1,649,755	5,332	19,542	--------	11,788,773
1897	(3)	95,087	30,364	[5] 8,966,924	--------	368,769	394	(1)	354,067	26,189	1,472,666	17,216	24,007	--------	13,288,984
1898	(3)	85,535	34,110	[5] 10,715,302	--------	394,545	--------	(1)	531,161	30,197	1,925,071	35,280	18,350	--------	16,047,209
1899	(3)	83,878	24,339	[6] 13,577,870	--------	435,308	--------	(1)	618,707	30,372	2,278,577	33,437	15,630	--------	19,668,569
1900	(4)	72,116	38,141	13,357,295	--------	475,432	--------	(1)	685,156	33,387	2,358,499	(4)	(4)	506,730	20,533,348
1901	(4)	108,774	37,374	14,355,917	--------	404,017	--------	(1)	907,130	49,197	2,283,700	(4)	(4)	564,191	21,795,883

1902	(4)	146,099	49,441	16,497,910		560,006		(1)	1,124,572	40,305	2,516,505	(4)	(4)	598,869	25,401,730
1903	(4)	143,913	49,818	15,650,932		546,875		(1)	1,176,439	45,623	2,707,818	(4)	(4)	932,428	25,274,281
1904	(4)	109,284	44,808	14,861,064		379,240		(1)	1,101,716	45,432	2,283,086	(4)	(4)	1,451,172	23,661,106
1905	(4)	277,130	54,781	20,573,736		468,092		(1)	1,499,481	53,137	3,400,593	(4)	(4)	1,660,857	32,231,129
1906	(4)	293,994	49,782	23,060,511		483,428		(1)	1,577,659	45,642	3,713,514	(4)	(4)	2,085,617	36,401,217
1907	385,478	270,634	19,089	26,513,214		467,499		(1)	1,545,280	52,028	4,112,896	(4)		1,088,493	40,779,564
1908	473,569	159,578	2,944	15,511,634		214,528		(1)	1,162,051	38,889	2,637,123	(4)		798,060	26,033,518
1909	523,551	222,711	(4)	24,905,525		261,808		(1)	1,347,478	42,981	3,943,948	(4)		964,359	39,315,065
1910	652,459	282,315	(4)	26,315,607		322,756		(1)	1,493,655	59,337	3,803,850	(4)		1,134,245	41,708,810
1911	686,172	311,382		21,923,935		330,418		(1)	910,411	40,180	2,291,049	(4)		1,947,258	35,551,489
1912	794,618	388,669		27,438,693		370,076		(4)	967,947	49,260	2,465,986	(4)		1,408,992	43,983,599
1913	758,486	351,846		28,753,444		364,578		(4)	1,303,603	76,221	2,472,752	(4)		1,577,522	46,299,530
1914	457,370	521,638		20,258,393		264,127		(4)	780,984	84,923	1,427,962	(4)		1,593,651	34,555,914
1915	684,461	684,658		25,622,862		256,973		(4)	629,807	136,552	1,391,446	(4)		1,825,982	41,581,150
1916	775,014	1,803,268		31,279,695		382,175		(7)	1,242,332	[7] 534,653	2,521,309	(4)		1,785,529	54,533,585
1917	993,184	3,694,302		27,912,025		411,326		(7)	1,304,230	[7] 497,533	3,349,761	(4)		2,100,983	55,606,828
1918	1,069,587	5,365,243	(4)	26,723,645		427,106		(4)	1,234,256	123,788	3,320,006	(4)		2,754,414	56,478,372
1919	751,067	5,481,660	(4)	20,501,831	(4)	260,915		(4)	930,516	62,546	1,413,932	(4)		1,474,347	44,180,557
1920	1,040,192	5,701,810		23,638,739	(4)	301,708		(4)	1,027,788	59,395	1,828,336	(4)		1,533,057	51,345,043
1921	746,916	3,028,423		9,769,476	(4)	85,728		(4)	280,476	27,260	397,892	(4)		804,815	25,287,622
1922	1,494,992	5,011,138		13,991,892	(4)	113,896		172,453	378,656	31,674	919,744	(4)		771,734	37,124,012
1923	1,783,948	6,473,606	(4)	25,624,286	(4)	304,511		232,941	774,887	69,068	1,762,775	(4)		1,189,606	56,977,534
1924	1,600,669	5,832,699		16,927,437	(4)	207,475		257,094	485,064	71,615	1,328,569	(4)		1,201,156	44,269,605
1925	2,219,409	7,261,187		19,427,603	(4)	216,488		314,159	421,691	79,257	1,546,032	(4)		1,579,812	51,266,943
1926	2,827,805	7,632,806		21,922,976	(4)	241,034		306,231	370,983	67,286	1,713,461	(4)		6,608,321	56,865,537
1927	3,602,642	[8] 7,213,619		16,777,291	(4)	227,120		282,048	316,754	71,271	1,923,427	(4)		1,680,586	51,092,143
1928	3,802,657	[8] 7,786,199		16,917,355	(4)	216,925		274,600	247,734	59,502	1,798,900	(4)		1,490,162	52,805,828
1929	4,299,470	[8] 8,521,132		[9] 19,856,968	(4)	209,166		281,994	314,859	66,723	1,928,583	(4)		1,776,796	59,883,845
1930	3,849,563	6,163,324		14,540,579	(4)	125,912		231,869	219,656	48,473	1,901,161	(4)		1,689,411	47,972,021

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[1] Utah included with Colorado.
[3] Included with Pennsylvania.
[4] Included under "Combined States."
[5] Includes New York.
[6] Includes Massachusetts and New York.
[7] Utah included with Washington.
[8] By-product coke only. Beehive coke can not be shown without disclosing individual operations.
[9] A small amount of beehive coke, produced in Ohio, is included with Pennsylvania.

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COAL[1]

By F. G. Tryon, L. Mann, and H. O. Rogers

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[1] Work on manuscript completed December, 1931.

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REVIEW OF INDUSTRY IN 1930

BITUMINOUS COAL

As in practically all other branches of industrial activity, the dominant influence shaping the course of the bituminous-coal industry in 1930 was the profound business depression. Following the stock-market collapse in October of the previous year, forerunners of the general recession began to appear almost immediately in many lines of industry. There was, for example, a conspicuous falling off in November and December, 1929, in manufacturing, building, and freight-car loadings. Bituminous-coal production, on the other hand, was surprisingly well maintained throughout this period and, indeed, even through the early weeks of 1930. It was not until February that there was any pronounced contraction in bituminous output.

Although the full force of the collapse was considerably delayed, when reaction did set in the effects were severe. Thus the average daily rate of bituminous production in February dropped 12.3 per cent below the average for January and was 16.5 per cent less than in the corresponding month of 1929. From this time onward the industry remained in the grip of depression. To be sure, there was a modest recovery with the approach of colder weather, but the advance fell far short of what, under normal conditions, is expected at that season of the year. (See fig. 30.)

For the year 1930 as a whole, the total production of bituminous coal was 467,526,299 net tons, a decrease of 12.6 per cent when compared with the year before, and 11.7 per cent below the average for the five years preceding. In this connection it is important to remember that in 1930 the full weight of the present depression had not been felt. Thus production in 1930 was 12.4 per cent larger than in 1921, the year when the post-war reaction was at its worst. It was not until 1931 that the full power of the world depression was disclosed.

In view of the sharp curtailment in industrial output the decline in coal production was no more than might have been expected. Indeed, the coal industry, on the whole, escaped rather fortunately. For example, the index of manufacturing, as compiled by the Federal Reserve Board, fell from 119 in 1929 to 96 in 1930, a decrease of 19.3 per cent. The construction industry, the railroads, and most branches of the mineral industry also show a more pronounced contraction than bituminous-coal mining. Nevertheless, the production of soft coal in 1930 was the lowest since the strike year of 1922.

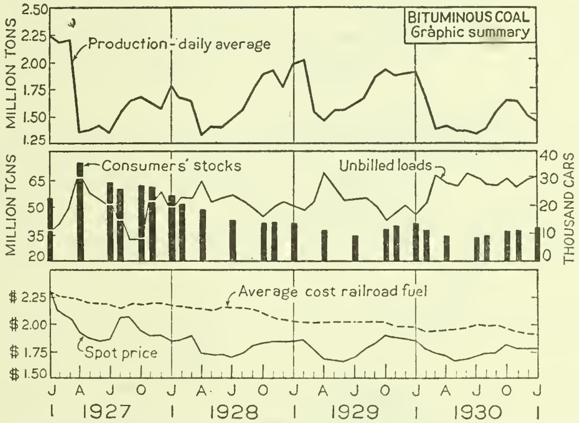

Figure 30.—Current trends of production, stocks, and prices of bituminous coal, 1927-1930

A graphic summary of the important developments in the bituminous-coal industry in 1930 is given in Figure 30. The long-time trend of production, which brings out the effects of changing business conditions, is best illustrated in Figure 31.

Further liquidation of consumers' stocks.—One of the few favorable features of the coal trade in 1930 was the fact that the effects of the general depression were not accentuated by the accumulation of excessive stocks, as has sometimes happened under similar circumstances in the past. As a matter of fact, throughout the first half of the year production fell considerably short of consumption, which resulted in a heavy draft on stocks. (See fig. 30.) From 40,300,000 tons on January 1, reserves in the hands of commercial consumers and retailers declined to 32,200,000 tons on July 1, a reduction of

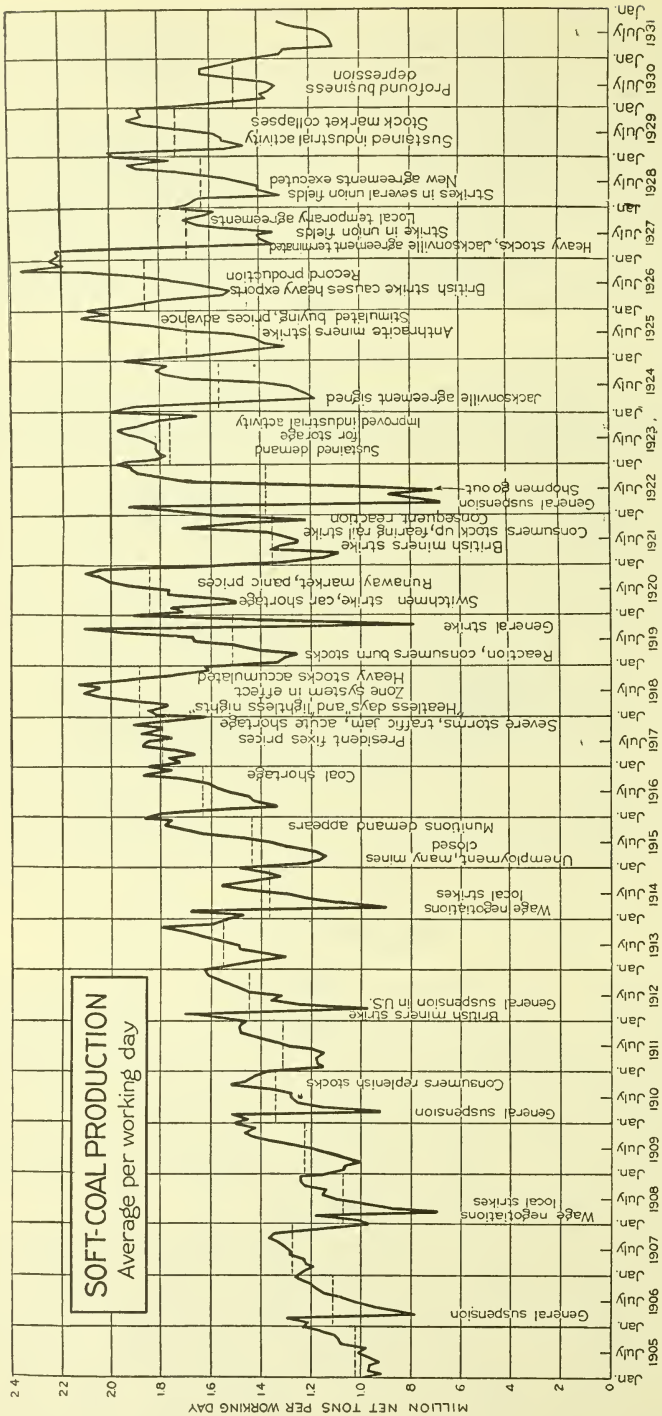

FIGURE 31.—Average production of bituminous coal per working day in each month, 1905–1930

8,100,000 tons in six months. This was the smallest tonnage held by consumers since the close of the prolonged suspension of mining in the fall of 1922. During the last half of the year consumers added to their stocks, as they normally do with the approach of the heating season, but the increase was moderate and at the close of the year the commercial reserves stood at 37,200,000 tons. Thus, the net withdrawal from storage during the course of the year was 3,100,000 tons.

Aside from reserves held by the retail coal dealers, the decline in commercial reserves during 1930 was general. The most conspicuous reduction occurred at the plants of the general industrials, where the tonnage on hand at the end of the year was 19.2 per cent less than at the beginning. Substantially lower stocks were also reported by the other principal groups of consumers, the decline ranging from 5 per cent for the railroads to 9.6 per cent for the coal-gas plants. Stocks in retail yards, however, showed a slight gain, and were 2.5 per cent higher than when the year began.

Decline in home consumption.—Consumption within the United States in 1930 declined by almost exactly the same proportion as production, being 12.4 per cent less than in the year preceding. Allowing for exports, imports, and changes in commercial stocks, the total consumption during the year amounted to 454,990,000 tons, as against 519,555,000 tons in 1929. Throughout the year the trend of consumption was steadily downward. In the first quarter the rate was 9.6 per cent below that of the corresponding period of the previous year, but as the country slipped deeper into the depression the rate of consumption fell still lower, finally reaching 15.6 per cent less than the 1929 level in the last quarter.

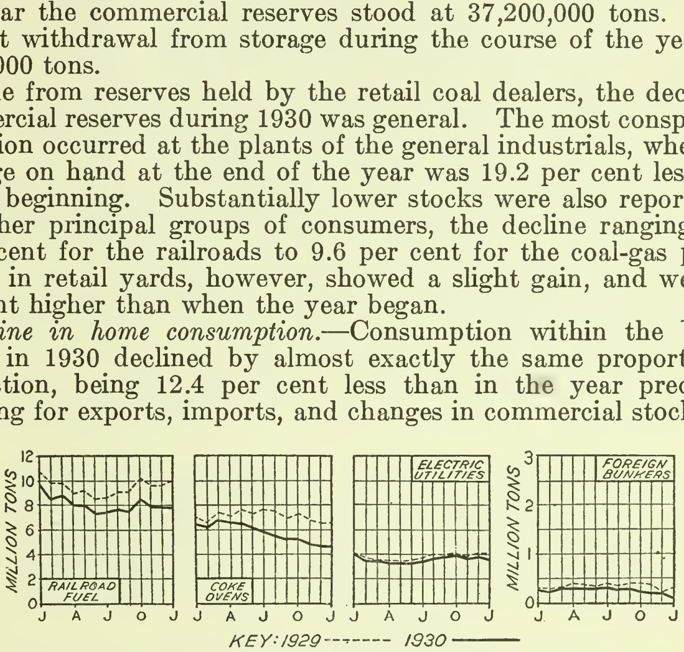

FIGURE 32.—Monthly consumption of bituminous coal by locomotives of Class I railroads, by-product and beehive coke ovens, electric public utilities, and ships engaged in foreign trade, 1929 and 1930

Throughout 1930 all principal groups of consumers in practically all parts of the country were using less than in the year before, but the effect of the depression was not uniform, and some consumers were affected much more seriously than others. The foregoing diagrams trace the trend month by month in four of the most important branches of consumption.

Consumption of locomotive fuel by Class I steam railroads, as indicated by the first of the charts (see fig. 32) in each month of the year lagged far short of the corresponding period of 1929, the decrease ranging from 5.3 per cent in January to 18 per cent in December. The aggregate consumption for the year was 13.6 per cent less than in 1929.

Even more conspicuous was the decline that occurred in the coke industry. From the record consumption of 86,786,474 tons in 1929, the total coal used at by-product and beehive ovens dropped to

69,805,624 tons in 1930, a decrease of 19.6 per cent. The decline was especially marked at the beehive ovens, which used 57.3 per cent less coal in 1930 than in 1929; but the by-product ovens also sharply curtailed operations, and their total consumption for the year stood 14.6 per cent below that of the previous year.

A much more favorable showing is made by the electric public utilities. The total consumption of coal by the utilities in 1930 amounted to 42,898,067 tons, as against 44,937,230 tons in the year preceding, a decrease of only 4.5 per cent. This relatively favorable record is explained partly by the rapid growth in the demand for electricity, which was checked only slightly by the depression, and partly by the prolonged drought that extended throughout the last half of 1930, reducing the output of many hydroelectric plants and causing the deficit to be supplied by electricity generated by coal.

The sharp reduction in foreign trade during the year is reflected in deliveries of bituminous coal for bunkering purposes. In 1930 the total quantity of bunker coal supplied to ships in foreign trade was 18.4 per cent less than in 1929. The decline was particularly pronounced during the latter part of the year.

Figure 33 summarizes the trend of consumption for four other important groups of consumers for which information is available quarterly. It will be noted that the general industrials, as represented by a selected list of 1,850 typical plants, show a trend quite similar to the railroad fuel curve, with consumption running consistently below the 1929 level. The deliveries of a typical group of retail dealers indicate a much smaller departure from the previous year than the general industrial plants, largely because the consumption of coal for heating purposes is considerably less elastic, and it takes substantially the same amount of fuel to keep people warm in times of depression as when business is moving at high speed. On the other hand, the steel works and rolling mills are peculiarly sensitive to business conditions, and as a result, their consumption in 1930 fell far short of 1929. Partly because of efforts to speed up construction of public works, consumption of coal at cement plants was fairly well maintained in the first half of the year but declined sharply during the closing months.

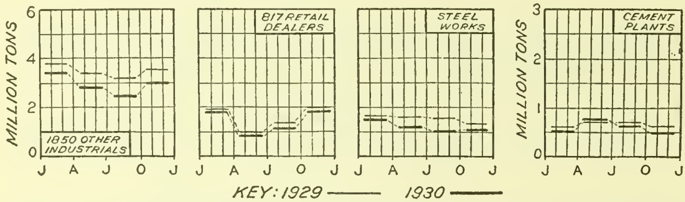

FIGURE 33.—Average monthly rate of consumption at steel works, cement plants, representative industrial plants, and the average rate of deliveries of a selected list of retail coal dealers, 1929 and 1930

Distribution trends.—The reduced requirements of all major classes of consumers in 1930 were naturally reflected in the movement of coal to practically all markets. A summary of the major currents of distribution is traced month by month in the diagrams below (fig. 34).

In spite of the general recession, the tidewater trade experienced a year of fairly steady demand. In fact, during the first four months, shipments from tidewater ports ran consistently above 1929, but from May through December were somewhat less. The total tonnage handled at tidewater in 1930 amounted to 37,178,592 tons, a decline of only 2.3 per cent when compared with the previous year.

The lake coal traffic in 1930 began with indications that for the fourth successive year all records would again be broken. After getting an early start, loadings at the lower Lake Erie ports rose rapidly to a peak and in May, June, and July were higher than in the corresponding months of the previous year. Thereafter, an abrupt decline set in, and the navigation season closed with the trade showing a loss of 3.1 per cent in comparison with 1929.

Exports fell to the lowest point of any year since 1922, when the movement to foreign destinations was greatly restricted by the prolonged suspension of mining. The total quantity of bituminous coal exported in 1930 amounted to 15,877,000 net tons, a decrease of 8.9 per cent when compared with the previous year. Shipments to almost all our principal foreign customers were curtailed during the year, but the most pronounced decline occurred in exports to the Caribbean and overseas. (See Table 73.) The decrease in the export trade reflects, at least in part, the reduced purchasing power of many foreign nations.

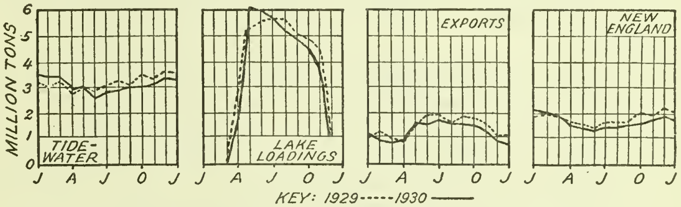

FIGURE 34.—Monthly movement of bituminous coal in the major currents of distribution, 1929 and 1930

The effects of the depression are likewise apparent in the New England trade, but here the decline was not particularly marked. The total receipts during the year amounted to 19,886,000 tons, a decrease of only 6.7 per cent when compared with the 21,311,000 tons received in 1929. Both the all-rail and coastwise movements shared in this decline; but it was accounted for chiefly by the rail shipments, which showed a decrease of 9.5 per cent in comparison with the previous year. The coastwise movement ran within 2.9 per cent of the 1929 tonnage.

Prices.—As might be expected, prices of bituminous coal tended downward during 1930, but the decline was much less sharp than for many other commodities. According to the Bureau of Labor Statistics the index of wholesale prices for all commodities in 1930 shows a decline of 10.5 per cent when compared with 1929. By contrast, Coal Age's average spot price of bituminous coal shows a decline of 2.2 per cent; the average cost of railroad fuel (excluding freight charges), 3 per cent; and the average sales realization of operators, 4.5 per cent. This relative resistance to sharp price reductions in 1930 may be explained largely by the fact that throughout the period of postwar prosperity prices of commodities in general remained comparatively stable,[2] whereas the price of bituminous coal, aside from minor upturns occasioned by strikes, has been tending downward since 1922 as a result of intense competition both from within and without the industry.

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[2] Commerce Yearbook, 1930, vol. 1, pp. 66–75.

During the course of the year spot prices for the country as a whole fluctuated within rather narrow limits, the Coal Age average ranging from $1.88 per ton in January to $1.68 in the late spring and summer months.[3] (See fig. 35.) For the first six months the average was $1.75, the same as for the corresponding period of 1929. Thereafter, however, quotations dropped somewhat below the level for the previous year. The average for the year as a whole was the lowest since 1915.

That contract prices also moved downward is indicated by the trend of the average sales realization reported by the operators. For the industry as a whole the sales realization on all coal produced in 1930 was $1.70, as against $1.78 the year before. With the exception of a few of the smaller producing States, the decline was country wide. Among the substantial producers the greatest losses were shown by Oklahoma, Montana, and Washington, where the average value of the coal mined fell by 20 cents or more a ton. In Illinois the decrease averaged 13 cents. A more moderate decline was reported by the operators in the major fields of the Appalachian region. In Pennsylvania, for example, the average realization decreased by 8 cents a ton, while in West Virginia and Kentucky it was only 5 cents a ton less than in 1929.

Retail prices of coal, like those of other commodities, are slower to change than wholesale prices, but such price movement as occurred in retail coal markets during 1930 was generally downward. According to the Bureau of Labor Statistics, retail prices of bituminous coal in 38 cities declined from an average of $8.85 per ton in 1929 to $8.83 in 1930. The average cost of railroad fuel, excluding freight charges, was $1.95 in 1930 as against $2.01 in the year preceding.

Decrease in number of mines and miners.—The year witnessed a further reduction in the number of active mines. The number of commercial mines in operation at one time or another during 1930 was 5,891, or 166 less than in 1929. The number shut down during the year was doubtless still larger than these figures would indicate, for it is known that some mines operating in January and February were closed as the depression deepened. Even so, the number in operation was 3,440 less than in 1923.

The closing of additional mines meant the discharge of still more men. In 1930, 493,202 were employed, as against 502,993 in 1929. These figures represent the average number on the pay rolls of the operating mines during the period of their activity, and they indicate a net decrease of 9,791 men. But this does not indicate the full extent of the reduction in number employed, for it includes the unknown number of men at mines that were operating in January but shut down some time later in the year.

The decline in number employed has been going on throughout the period of deflation that began in 1924, but the plight of the men discharged in 1930 was particularly serious, because they stood little chance of being absorbed in other industries on account of the general depression. The total reduction in working force from the peak year

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[3] Coal Age, vol. 36, No. 2, February, 1931, p. 103.

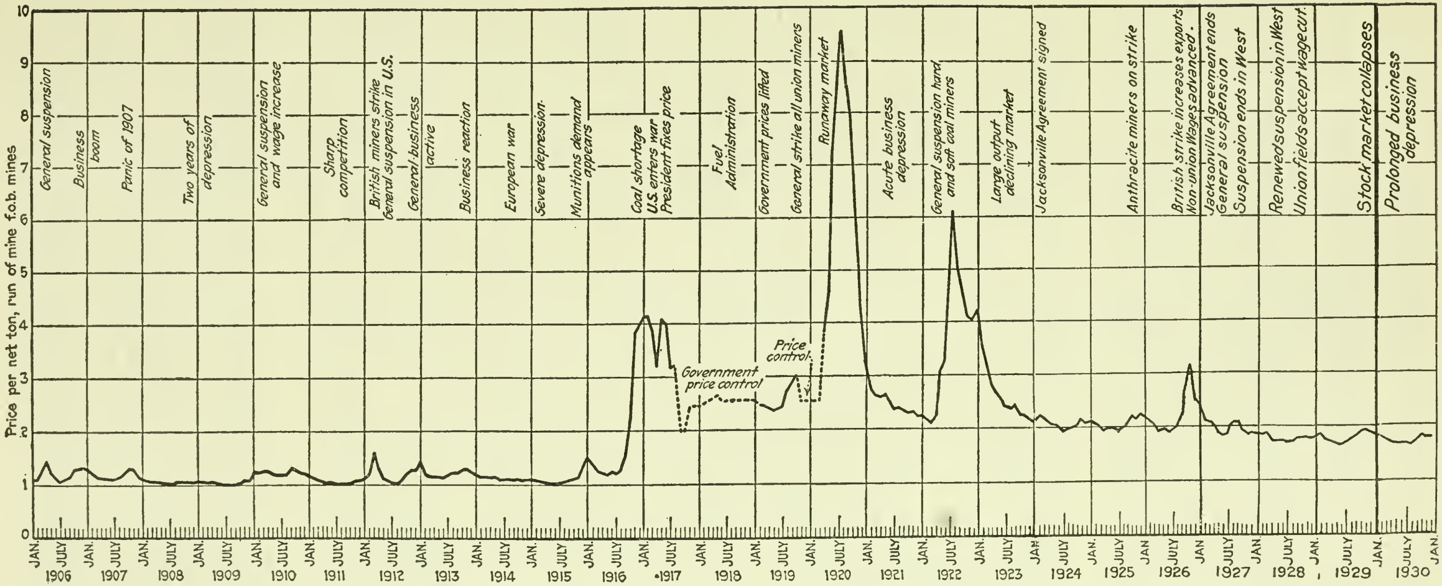

FIGURE 35.—Monthly average spot prices of bituminous coal, f. o. b. mines, as quoted by Coal Age, 1906–1930

1923 up to 1930 was 212,000, and the number on the rolls in 1930 was actually less than in any year since 1906.

Decline in working time.—Even the men who were fortunate enough to retain their jobs did not escape the pinch of hard times, as reduced working time cut deeply into earnings. From an average of 219 days in 1929 the number of days worked by the bituminous mines of the country fell to 187 days in 1930. Even where there was no reduction in wage rates this would represent a loss of 14.6 per cent in earning capacity. Moreover, the national average conceals the seriousness of the decreased operating time in many of the coal-producing States. To illustrate, the mines in Arkansas worked only 115 days and those in Kansas 126 days, while the working time in such important States as Illinois, Indiana, Iowa, and Oklahoma ranged around 150 days in 1930.

Continued progress in mechanization.—The depression failed to retard the rapid advance in mine mechanization that has been a feature of the industry in recent years. On the contrary, the progress made in 1930 was hardly less extraordinary than that of the previous year. Outstanding among the developments was the large increase in the tonnage of bituminous coal mechanically loaded. From 37,862,000 tons in 1929, the production of bituminous coal by mechanized mining methods advanced to 46,982,000 tons in 1930, a gain of 9,120,000 tons (24.1 per cent) in a year when the national demand for coal declined by more than 12 per cent. In addition, the record for the year shows that a larger proportion of the total output was mined by stripping methods than ever before, and an advance was also reported in the proportion undercut by machines. A quantitative measure of the effects of this progress in mechanization is afforded by the output per man per day, which increased from 4.85 tons in 1929 to 5.06 in 1930, a gain of 4.3 per cent.

From the viewpoint of engineering, the gradual mechanization of the industry represents a great forward stride. The process includes much more than mechanical loading; it includes also machine cutting, power drilling of shot holes, more effective explosives, electric haulage, larger mine cars, improvement of hoist and tipple, mechanical sizing and cleaning, and scores of lesser advances. By reducing production costs mechanization has assisted coal to meet the competition of other sources of power; yet from a broader economic viewpoint, the process carries implications which can not be ignored. One of them is the effect upon employment. To produce 1 ton of bituminous coal in 1920 required 2 man-hours of labor; to do it in 1930 required only 1.6 man-hours, and the change has been a contributing—yet by no means the principal—cause of the widespread unemployment in coal-mining communities.

A second implication is the effect upon capacity. It is clear that mechanization in its broadest sense—not merely mechanical loading—tends to increase capacity by making it possible for the same number of mines and men to get out more coal. Thus in 1930 the potential capacity of the mines in operation was 770,000,000 tons, assuming a working year of 308 days, as against 752,000,000 in 1929. Included in the figure of 770,000,000 tons, however, were a number of mines that were in operation in January and February, 1930, but closed down as the depression became more serious, and it is clear that the capacity in operation at the end of 1930 was materially less. Even

770,000,000 tons represents a vast improvement in the period of maximum overdevelopment, for in the peak year 1923 the capacity in operation was 970,000,000 tons. (See fig. 36.)

PENNSYLVANIA ANTHRACITE

The year 1930 was in many respects a colorless one for the Pennsylvania anthracite industry. An outstanding event was the peaceful negotiation of a 5½-year wage agreement with the workers, marking a greater understanding between labor and employers than ever before.

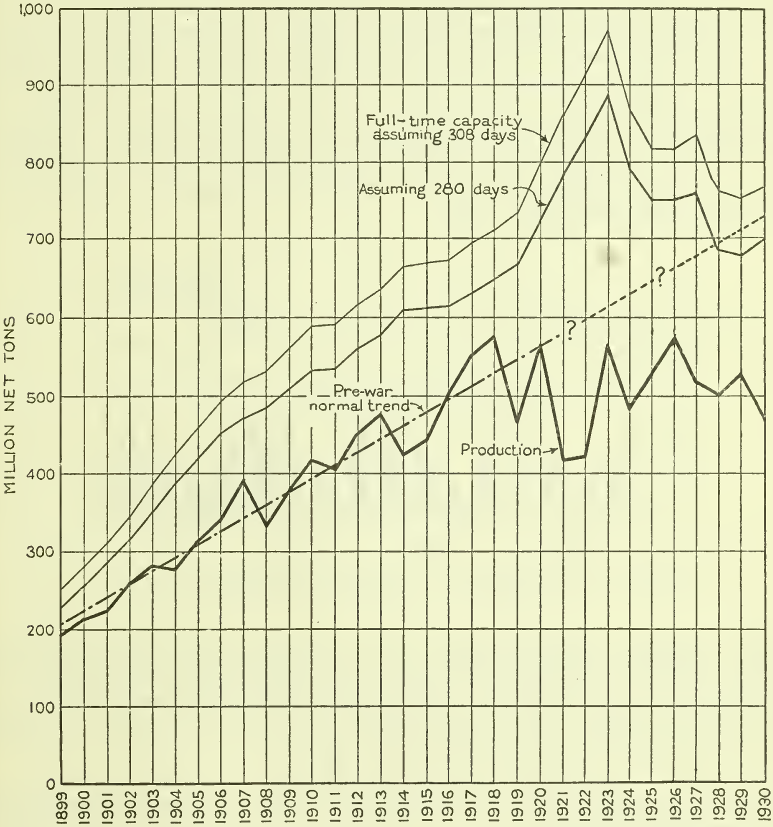

FIGURE 36.—Trend of bituminous coal production and of coal-mine capacity in the United States, 1899–1930

After three successive years of declines in both production and average price realization, production in 1930 dropped still further to a total of 61,950,747 gross tons, which was 3,967,284 tons, or 6 per cent, less than in 1929. The average annual production for the 10 years 1921 to 1930 was 68,869,072 tons. The figure for 1930 was 10 per cent under this 10-year average.

Notwithstanding the apparently unfavorable statistical picture, 1930 actually offered definite encouragement to the industry. It must be remembered that the generally subnormal business conditions that prevailed throughout 1930 showed in many basic industries decreases in total business that were far more unfavorable than the 6 per cent decline in anthracite production.

The decrease for the year was 3,967,284 tons. During the first four months production decreased 2,030,000 tons, and during December 1,327,000 tons. On the other hand, although the usual spring discounts on April 1 did not succeed in stimulating the demand, by June consumers had begun to build winter stocks. The summer months of June, July, and August, 1930, showed 1,500,000 tons larger production than did the same months of 1929. (See fig. 37.)

Practically every important distributing area showed similar trends throughout the year. Distribution figures for the Middle Atlantic States are not available; but, with full consideration for the general conditions affecting all industry in 1930, anthracite is believed to have held its own so far as the domestic market is concerned. Exports to Canada decreased from 3,014,556 long tons in 1929 to 2,260,835 in 1930. Anthracite imports in 1930 were 603,000 long tons, an increase of 168,000 long tons over 1929.

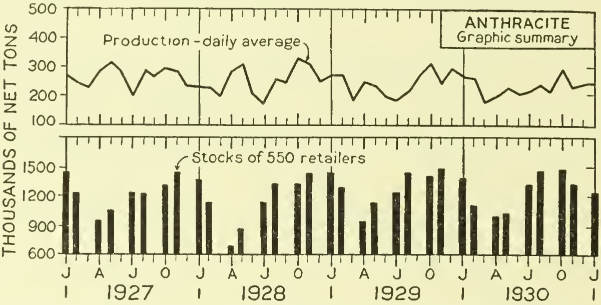

FIGURE 37.—Current trends of production and retail dealers' stocks of Pennsylvania anthracite, 1927-1930

New England total receipts were 8,389,000 tons or 650,000 tons less than in 1929. The loadings at Lake Erie ports decreased from 1,321,328 net tons in 1929 to 1,232,137 tons in 1930, or 6.8 per cent. At Duluth-Superior the receipts were 460,708 net tons, an increase of 59,459 tons, or 14.8 per cent, over 1929.

The total consumption for 1930, allowing for withdrawals from producers' storage yards, was 60,382,000 tons, almost 3,500,000 tons less than that for 1929.

The year was also uneventful with respect to prices, except for a still further decline in average realization. Generally speaking, the circular price quotations of independent operators followed those of the large companies, with concessions forced by dull markets. As in 1929, the prices of domestic sizes were reduced 60 cents a ton on April 1. The periodic summer increases were not uniform either in amount or as to dates, but all the companies had increased their circular prices 55 cents a ton by September 1. The full 60-cent reduction was not restored because in June, 1930, the second third of the Pennsylvania State tax was removed; therefore, the spring prices were increased only 55 cents, and the consumer was given the benefit of this 5-cent tax saving.

The average sales realization on breaker shipments of all sizes was $6.20 in 1930, as against $6.30 in 1929. The average realization on buckwheat No. 1 increased 12 cents but on all other steam sizes was less than in 1929. The increased buckwheat realization influenced the average figure for all steam sizes, so that it shows a 3-cent increase over the previous year. (See fig. 38.)

Although the general anthracite picture, according to the statistical story, would seem to be one of recession, the underlying position of the industry is thought to have been strengthened, and the actual results are felt to be encouraging. As has already been stated, the 5-cent relief through tax reduction has been responsible for part of the price reduction. Stocks continued to bear a relation to current and expected demand from month to month dictated by recent experience.

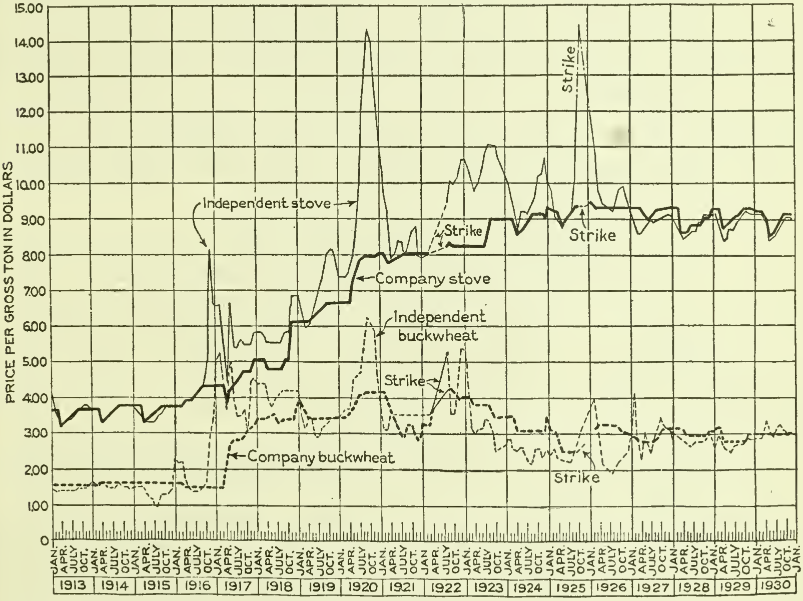

FIGURE 38.—Monthly prices of Pennsylvania anthracite, f. o. b. mines, as quoted by Coal Age, 1913–1930. Prices shown are averages of the range as quoted on the New York market

The outstanding anthracite problems became still more intensified during 1930—decreased percentage of profitable and increased proportion of unprofitable sizes; gains by competitive fuels; and increased imports of foreign anthracite.

The concerted attack upon merchandising problems has reached a point where operators feel that they are justified in claiming definite upward progress notwithstanding the statistics. This claim is based upon actual comparative figures of distributors who have passed through the schools conducted by the industry and on actual tonnage figures of consuming capacity gained, in competition with other fuels, either by replacement or by obtaining the initial installation. It can not be denied that both operators and distributors are more alert to the consumer's interest than in the past, realizing that good will is essential to any long-time prosperity in the Pennsylvania anthracite industry.

There was practically no change in the number of active operations, including breakers, washeries, and dredges. These numbered 296 during 1930, one less than in the previous year. There were 9 fewer breakers, but 4 more washeries and 4 more dredges. (See Table 22A.)

The number of men employed changed slightly. In 1929 the labor force numbered 151,501 and in 1930, 150,804. The employed force remained lower than in any other year since 1920. The average number of days worked also decreased from 225 to 208. The output per man per day improved from 1.93 to 1.97 tons, but the annual output per man dropped from 435 to 411 tons.

ACKNOWLEDGMENTS

This report marks the fiftieth year of the continuous statistical record of coal production in Mineral Resources of the United States. Like its predecessors, the report is made possible by the voluntary cooperation of those interested in the coal industry, and it is a pleasure to record the generous support of the thousands of individual producers, distributors, and consumers who have supplied information. Detailed reports on production and mine operation have been made by the 6,000 commercial mines, and on stocks and consumption by approximately 5,000 representative consumers.

Particularly valuable has been the help afforded by the traffic managers of the coal-originating railroads, who have furnished detailed records of shipments on their lines. For the weekly and daily information on cars of coal loaded, which forms the principal basis of the current estimates of weekly production, the bureau is under obligations to M. J. Gormley, chairman of the car service division of the American Railway Association, and particularly to H. E. Ewin and G. Freeburg. Current records of shipments by waterways have been furnished by the United States Engineers.

Acknowledgment is also made of the generous help of the State mine inspectors, who have assisted in the collection of returns by furnishing information in their files, thereby increasing the accuracy of the statistics. Data have been given by W. B. Hillhouse, chief mine inspector, Birmingham, Ala.; Claude Speegle, State inspector of mines, Fort Smith, Ark.; James Dalrymple, chief inspector of coal mines, Denver, Colo.; J. S. Millhouse, director department of mines and minerals, Springfield, Ill.; A. C. Dally, chief mine inspector, Indianapolis, Ind.; W. A. Scheck, secretary to the mine inspectors, Des Moines, Iowa; James Sherwood, State mine inspector, Pittsburg, Kans.; J. F. Daniel, chief inspector of mines, Lexington, Ky.; John J. Rutledge, chief mine engineer, Maryland Bureau of Mines, Baltimore, Md.; F. G. Fenix, chief inspector, Joplin, Mo.; Edward Davies, State coal-mine inspector, Helena, Mont.; Edwin Rupp, State coal-mine inspector, Bismarck, N. Dak.; G. F. Miles, chief, division of labor statistics, Columbus, Ohio; James R. Ballard, department of mines, Oklahoma City, Okla.; W. H. Glasgow, secretary of mines, department of mines, Harrisburg, Pa.; A. W. Evans, chief mine inspector, Nashville, Tenn.; N. M. Bullock, State mine inspector, Rockdale, Tex.; William R. Reese, chief mine inspector, Seattle, Wash.; R. M. Lambie, chief, department of mines, Charleston, W. Va.; and Lyman Fearn, chief coal-mine inspector, Rock Springs, Wyo.

The bureau finds of especial value the cooperation of the secretaries of local associations of coal operators, on account of their intimate knowledge of conditions in their several districts. Many of them have supplied current reports of production by fields. For information on 1930 the bureau is indebted to P. H. Greenlaw, secretary, Fifth and Ninth District Coal Traffic Bureau, St. Louis, Mo.; Jonas Waffle, managing director, Coal Trade Association of Indiana, Terre Haute, Ind.; C. E. Reed, secretary, West Kentucky Coal Bureau, Louisville, Ky.; J. E. Johnson, secretary, Hazard Coal Operators' Exchange, Lexington, Ky.; E. R. Clayton, secretary, Harlan County Coal Operators' Association, Harlan, Ky.; R. F. Chumley, statistician, Utah Coal Producers' Association, Salt Lake City, Utah; C. B. Neel, secretary, Virginia Coal Operators' Association, Norton, Va.; A. W. Laing, treasurer, Winding Gulf Operators' Association, Beckley, W. Va.; S. C. Higgins, secretary-traffic manager, New River Coal Operators' Association, Mount Hope, W. Va.; T. N. Moran, secretary, Fairmont Coal Operators' Association, Fairmont, W. Va.; A. O. Wilson, statistician, Kanawha Coal Operators' Association, Charleston, W. Va.; and W. E. Maltby, manager, Washington Coal Producers' Association, Seattle, Wash. To these and many others who have supplied information cordial acknowledgment is made.

STATISTICAL SUMMARY

TABLE 1.—*Salient statistics of the coal industry in 1930*

[Figures for bituminous in net tons; anthracite in gross tons]

	Bituminous	Anthracite
Production ... tons	467,526,299	61,950,747
Value at mines	$795,483,000	$354,574,000
Average value per ton	$1.70	$5.72
Average spot price as quoted by Coal Age	$1.75	(1)
Number of active mines of commercial size	5,891	[2] 296
Stocks of commercial consumers:		
Jan. 1 ... tons	40,300,000	(1)
Dec. 31 ... do	37,200,000	(1)
Net change during year ... do	3,100,000	(1)
Exports ... do	15,877,000	2,278,000
Imports ... do	241,000	603,000
Consumption (calculated) ... do	454,990,000	60,382,000
Capacity of mines with present labor force (assuming 303.5 working days in the anthracite field and 308 working days in the bituminous field) ... tons	770,000,000	90,000,000
Average number of days worked	187	208
Average days idle:		
All causes	121	95.5
Through strikes and lockouts	2	1
Other causes	119	94.5
Average number employed:		
Miners, loaders, and shot firers	313,617	78,770
Haulage and track	57,343	13,736
Other underground	55,782	26,244
Surface	66,460	32,045
Output per man:		
Per day ... tons	948	2.21
Per year ... do	5.06	[3] 460
Number of cutting machines	14,237	185
Quantity cut by machines ... tons	362,425,163	1,259,038
Per cent of output cut by machines	77.5	2.0
Number of power shovels in strip pits	341	108
Quantity produced by stripping ... tons	19,842,359	2,264,543

[1] Data not available. For changes in producers' stocks see Table 3.
[2] Number of breakers, washeries, and dredges.
[3] Net tons.

TABLE 2.—*Summary of coal produced, value, men employed, days worked, and output per man per day, by States, 1929 and 1930*

State	Net tons					Value		Number of employees					Average number of days worked	Average tons per man per day
								Underground						
	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for power and heat	Made into coke at mines	Total quantity	Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total		
1929														
Alabama	17,459,449	317,675	166,799	------------	17,943,923	$37,309,000	$2.08	15,287	2,961	3,244	3,716	25,208	231	3.08
Alaska	94,600	5,010	1,000	------------	100,610	528,000	5.25	50	10	24	68	152	174	3.81
Arizona	------------	10,060	72	------------	10,132	44,000	4.34	33	2	2	2	39	137	1.90
Arkansas	1,659,573	26,020	9,515	------------	1,695,108	5,624,000	3.32	2,906	412	316	665	4,299	146	2.70
California, Idaho, Nevada, and Oregon	7,840	2,222	260	------------	10,322	37,000	3.58	23	3	6	10	42	113	2.17
Colorado	8,664,817	824,049	183,746	248,129	9,920,741	26,254,000	2.65	7,981	1,227	1,226	1,623	12,057	187	[1]4.40
Georgia	43,921	458	257	------------	44,636	136,000	3.05	---------	---------	---------	102	102	260	1.68
Illinois	55,712,372	3,991,337	953,932	------------	60,657,641	113,453,000	1.87	36,781	6,336	6,764	6,844	56,725	177	6.06
Indiana	17,387,599	630,524	326,235	------------	18,344,358	29,880,000	1.63	8,852	1,615	1,561	3,222	15,250	172	7.00
Iowa	3,383,801	800,029	57,239	------------	4,241,069	11,948,000	2.82	5,408	655	693	539	7,295	195	2.98
Kansas	2,635,600	251,807	88,564	------------	2,975,971	6,697,000	2.25	3,638	333	218	950	5,139	160	3.63
Kentucky	59,125,101	860,161	477,338	------------	60,462,600	93,283,000	1.54	36,090	7,586	7,203	7,770	58,649	222	4.64
Maryland	2,518,092	119,829	11,193	------------	2,649,114	4,640,000	1.75	2,170	395	362	362	3,289	246	3.28
Michigan	744,517	10,725	49,627	------------	804,869	2,904,000	3.61	899	164	154	119	1,336	217	2.77
Missouri	3,467,666	498,217	64,428	------------	4,030,311	9,778,000	2.43	3,433	402	447	1,336	5,618	185	3.87
Montana	3,221,905	137,790	47,831	------------	3,407,526	7,561,000	2.22	1,326	303	202	452	2,283	189	7.90
New Mexico	2,514,971	51,228	56,570	------------	2,622,769	8,314,000	3.17	2,107	350	294	482	3,233	214	3.79
North Carolina	46,280	3,200	2,700	------------	52,180	177,000	3.39	120	10	10	20	160	260	1.25
North Dakota	1,442,988	380,640	38,502	------------	1,862,130	3,157,000	1.70	772	92	74	483	1,421	192	6.84
Ohio	20.840,851	2,708,715	139,911	------------	23,689,477	35,733,000	1.51	17,689	2,452	2,093	3,165	25,399	201	4.64
Oklahoma	3,601,911	125,830	46,339	------------	3,774,080	11,481,000	3.04	3,944	703	616	1,058	6,321	178	3.36
Pennsylvania bituminous	127,064,532	8,048,253	1,095,730	7,307,726	143,516,241	258,607,000	1.80	87,705	13,777	14,563	15,729	131,774	230	4.73
South Dakota	200	12,654	------------	------------	12,854	38,000	2.96	32	---------	---------	---------	32	127	3.17
Tennessee	5,101,399	63,032	55,001	186,032	5,405,464	9,122,000	1.69	4,880	909	755	1,075	7,619	228	3.11
Texas	1,075,365	11,066	14,237	------------	1,100,668	1,600,000	1.45	885	128	105	195	1,313	212	3.95
Utah	5,072,527	47,955	16,678	23,361	5,160,521	12,725,000	2.47	2,076	467	323	592	3,458	211	[1]7.09
Virginia	12,119,712	92,192	41,244	495,158	12,748,306	20,942,000	1.64	6,509	1,714	1,982	1,848	12,053	249	4.24
Washington	2,299,619	153,472	33,342	34,894	2,521,327	8,647,000	3.43	1,810	333	346	457	2,946	227	3.77
West Virginia	134,241,631	2,946,830	497,087	833,307	138,518,855	215,110,000	1.55	59,324	15,984	14,278	15,356	104,942	247	5.34
Wyoming	6,385,615	131,578	187,597	------------	6,704,790	17,052,000	2.54	2,948	629	508	754	4,839	230	6.02
Total bituminous	497,934,454	23,262,558	4,662,974	9,128,607	534,988,593	952,781,000	1.78	315,678	59,952	58,369	68,994	502,993	219	4.85

Pennsylvania anthracite	65, 294, 579	3, 233, 023	5, 300, 593	------------	73, 828, 195	385, 643, 000	5. 22	77, 395	14, 923	25, 538	33, 645	151, 501	225	2. 17
Grand total	563, 229, 033	26, 495, 581	9, 963, 567	9, 128, 607	608, 816, 788	1, 338, 424, 000	2. 20	393, 073	74, 875	83, 907	102, 639	654, 494	221	4. 21
1930														
Alabama	15, 129, 163	346, 698	94, 197	------------	15, 570, 058	31, 616, 000	2. 03	15, 173	2, 700	3, 004	3, 516	24, 393	189	3. 38
Alaska	112, 900	6, 000	1, 200	------------	120, 100	631, 000	5. 25	40	7	20	32	99	294	4. 13
Arizona	------------	9, 084	------------	------------	9, 084	29, 000	3. 19	18	3	2	1	24	196	1. 94
Arkansas	1, 513, 574	8, 471	11, 389	------------	1, 533, 434	5, 153, 000	3. 36	3, 185	469	387	585	4, 626	115	2. 87
California, Idaho, and Oregon	12, 300	4, 713	1, 525	------------	18, 538	100, 000	5. 39	57	7	9	65	138	74	1. 81
Colorado	7, 004, 510	891, 447	180, 119	120, 834	8, 196, 910	21, 485, 000	2. 62	7, 411	1, 134	958	1, 588	11, 091	169	[1] 4. 38
Georgia	7, 033	47	12	------------	7, 092	18, 000	2. 54	43	7	4	6	60	71	1. 66
Illinois	48, 922, 279	3, 993, 263	815, 688	------------	53, 731, 230	93, 484, 000	1. 74	33, 893	5, 844	6, 713	7, 153	53, 603	156	6. 42
Indiana	15, 235, 765	942, 854	311, 343	------------	16, 489, 962	26, 178, 000	1. 59	8, 050	1, 485	1, 327	3, 019	13, 881	157	7. 56
Iowa	2, 933, 518	903, 038	56, 015	------------	3, 892, 571	10, 385, 000	2. 67	5, 883	675	713	630	7, 901	155	3. 18
Kansas	2, 109, 151	287, 919	32, 859	------------	2, 429, 929	5, 231, 000	2. 15	3, 160	367	212	1, 116	4, 855	126	3. 96
Kentucky	50, 011, 859	817, 667	379, 469	------------	51, 208, 995	76, 186, 000	1. 49	35, 007	7, 084	7, 101	7, 482	56, 674	187	4. 83
Maryland	2, 148, 045	111, 828	10, 720	------------	2, 270, 593	3, 690, 000	1. 63	2, 293	356	293	357	3, 299	197	3. 50
Michigan	609, 195	20, 802	31, 116	------------	661, 113	2, 323, 000	3. 51	884	182	122	106	1, 294	187	2. 73
Missouri	3, 253, 497	545, 836	53, 817	------------	3, 853, 150	8, 967, 000	2. 33	3, 560	441	395	1, 304	5, 700	166	4. 07
Montana	2, 827, 378	154, 724	39, 902	------------	3, 022, 004	6, 043, 000	2. 00	1, 185	248	155	497	2, 085	172	8. 45
New Mexico	1, 850, 048	59, 627	59, 758	------------	1, 969 433	6, 017, 000	3. 06	1, 956	290	226	430	2, 902	176	3. 85
North Carolina	24, 464	1, 276	2, 760	------------	28, 500	100, 000	3. 51	45	5	5	15	70	290	1. 40
North Dakota	1, 335, 883	344, 934	19, 340	------------	1, 700, 157	2, 768, 000	1. 63	638	74	50	496	1, 258	180	7. 50
Ohio	20, 132, 937	2, 306, 713	112, 328	------------	22, 551, 978	31, 643, 000	1. 40	17, 858	2, 359	2, 378	2, 979	25, 574	189	4. 67
Oklahoma	2, 691, 404	63, 692	38, 858	------------	2, 793, 954	7, 768, 000	2. 78	3, 445	639	460	880	5, 424	148	3. 49
Pennsylvania bituminous	113, 885, 163	6, 880, 568	944, 138	2, 752, 918	124, 462, 787	213, 584, 000	1. 72	89, 452	12, 690	13, 506	14, 502	130, 150	198	4. 82
South Dakota	1, 330	11, 480	------------	------------	12, 810	31, 000	2. 42	23	4	4	12	43	109	2. 73
Tennessee	4, 892, 501	136, 669	54, 754	46, 504	5, 130, 428	8, 417, 000	1. 64	5, 015	824	757	939	7, 535	196	3. 48
Texas	806, 117	15, 311	12, 444	------------	833, 872	1, 307, 000	1. 57	877	141	120	167	1, 305	181	3. 53
Utah	4, 185, 255	53, 344	7, 849	11, 093	4, 257, 541	10, 515, 000	2. 47	1, 925	489	428	662	3, 504	168	[1] 7. 23
Virginia	10, 414, 384	96, 153	35, 947	360, 893	10, 907, 377	17, 520, 000	1. 61	6, 422	1, 691	1, 857	1, 739	11, 709	200	4. 66
Washington	2, 089, 015	163, 002	33, 983	15, 928	2, 301, 928	7, 439, 000	3. 23	1, 681	289	410	421	2, 801	205	4. 01
West Virginia	117, 480, 773	2, 823, 592	462, 528	705, 745	121, 472, 638	181, 722, 000	1. 50	61, 431	16, 089	13, 607	14, 861	105, 988	204	5. 61
Wyoming	5, 779, 128	120, 303	188, 702	------------	6, 088, 133	15, 133, 000	2. 49	3, 007	750	559	900	5, 216	188	6. 20
Total bituminous. 1930	437, 398, 569	22, 121, 055	3, 992, 760	4, 013, 915	467, 526, 299	795, 483, 000	1. 70	313, 617	57, 343	55, 782	66, 460	493, 202	187	5. 06
Total bituminous, 1929	497, 934, 454	23, 262, 558	4, 662, 974	9, 128, 607	534, 988, 593	952, 781, 000	1. 78	315, 678	59, 952	58, 369	68, 994	502, 993	219	4. 85
Total anthracite, 1930	61, 202, 057	3, 144, 434	5, 038, 346	------------	69, 384, 837	354, 574, 000	5. 11	78, 770	13, 736	26, 244	32, 054	150, 804	208	2. 21
Total anthracite, 1929	65, 294, 579	3, 233, 023	5, 300, 593	------------	73, 828, 195	385, 643, 000	5. 22	77, 395	14, 923	25, 538	33, 645	151, 501	225	2. 17
Grand total, 1930	498, 600, 626	25, 265, 489	9, 031, 106	4, 013, 915	536, 911, 136	1, 150, 057, 000	2. 14	392, 387	71, 079	82, 026	98, 514	644, 006	192	4. 34
Grand total, 1929	563, 229, 033	26, 495, 581	9, 963, 567	9, 128, 607	608, 816, 788	1, 338, 424, 000	2. 20	393, 073	74, 875	83, 907	102, 639	654, 494	221	4. 21

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[1] Probably too high because of practice, common in some districts, of men going into mines to shoot coal and load mine cars on days when tipples or mines, as a whole, are not in operation.

TABLE 3.—*Production, imports, exports, and consumption of anthracite and bituminous coal, 1917–1930, in net tons*

Calendar year	Production	Imports	Exports to—		Net changes in stocks [1]	Consumption in the United States [2]
			Canada and Mexico	All other countries		
Anthracite:						
1917	99, 612, 000	13, 000	5, 917, 000	90, 000	−450, 000	94, 068, 000
1918	98, 826, 000	37, 000	4, 910, 000	58, 000	+1, 120, 000	92, 775, 000
1919	88, 092, 000	83, 000	4, 871, 000	106, 000	+1, 680, 000	81, 518, 000
1920	89, 598, 000	32, 000	4, 987, 000	417, 000	−1, 560, 000	85, 786, 000
1921	90, 473, 000	9, 000	4, 569, 000	108, 000	+3, 855, 000	81, 950, 000
1922	54, 683, 000	234, 000	2, 579, 000	70, 000	−4, 530, 000	56, 798, 000
1923	93, 339, 000	300, 000	4, 993, 000	97, 000	+1, 635, 000	86, 914, 000
1924	87, 927, 000	118, 000	3, 932, 000	86, 000	+3, 310, 000	80, 717, 000
1925	61, 817, 000	383, 000	3, 098, 000	81, 000	−5, 040, 000	64, 061, 000
1926	84, 437, 000	814, 000	3, 947, 000	83, 000	+4, 000, 000	77, 221, 000
1927	80, 096, 000	119, 000	3, 248, 000	78, 000	+2, 218, 000	74, 671, 000
1928	75, 348, 000	385, 000	3, 298, 000	38, 000	−1, 254, 000	73, 651, 000
1929	73, 828, 000	487, 000	3, 378, 000	28, 000	−548, 000	71, 457, 000
1930	69, 385, 000	675, 000	2, 533, 000	19, 000	−119, 000	67, 627, 000
Bituminous:						
1917	551, 791, 000	1, 448, 000	18, 324, 000	5, 506, 000	----------------	529, 409, 000
1918	579, 386, 000	1, 457, 000	18, 316, 000	4, 034, 000	+27, 900, 000	530, 593, 000
1919	465, 860, 000	1, 012, 000	12, 064, 000	8, 050, 000	−34, 900, 000	481, 658, 000
1920	568, 667, 000	1, 245, 000	16, 458, 000	22, 059, 000	+22, 800, 000	508, 595, 000
1921	415, 922, 000	1, 258, 000	13, 590, 000	9, 541, 000	+2, 200, 000	391, 849, 000
1922	422, 268, 000	5, 060, 000	10, 938, 000	1, 475, 000	−12, 000, 000	426, 915, 000
1923	564, 565, 000	1, 882, 000	16, 960, 000	4, 494, 000	+26, 000, 000	518, 993, 000
1924	483, 687, 000	417, 000	12, 746, 000	4, 354, 000	−17, 000, 000	484, 004, 000
1925	520, 053, 000	602, 000	13, 547, 000	3, 915, 000	+4, 000, 000	499, 193, 000
1926	573, 367, 000	486, 000	13, 762, 000	21, 510, 000	+6, 000, 000	532, 581, 000
1927	517, 763, 000	550, 000	14, 724, 000	3, 288, 000	+500, 000	499, 801, 000
1928	500, 745, 000	547, 000	14, 050, 000	2, 114, 000	−13, 700, 000	498, 828, 000
1929	534, 989, 000	495, 000	14, 727, 000	2, 702, 000	−1, 500, 000	519, 555, 000
1930	467, 526, 000	241, 000	13, 667, 000	2, 210, 000	−3, 100, 000	454, 990, 000

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[1] Anthracite figures are producers' stocks; bituminous, consumers' stocks. Plus sign denotes coal produced but added to stocks and not consumed; minus sign denotes coal consumed that was withdrawn from stocks carried over from preceding year. Anthracite data from Federal Trade Commission cost reports (Coal, No. 2, p. 27) and hearings before Frelinghuysen coal committee, S. Res. 126, 66th Cong., 1st sess. (pt. 1, p. 308). Anthracite figures for 1917 and 1918 represent the coal year, since then calendar years, and are in part estimates. Bituminous data from reports on consumers' stocks of bituminous coal, issued by U. S. Bureau of Mines, and article in Coal Age, Aug. 26, 1920, p. 429, by C. E. Lesher, formerly coal statistician, U. S. Geological Survey, and director of statistical division, U. S. Fuel Administration.

[2] Production tonnage, plus imports and minus exports, plus or minus the decrease or increase, respectively, of the net change in coal stocks.

TABLE 4.—*Salient statistics of the bituminous-coal industry in 1913, 1923, and 1926–1930*

	1913	1923	1926	1927	1928	1929	1930
Production:							
Loaded at mines for shipment net tons	403,434,246	505,859,295	526,285,997	480,223,441	467,347,915	497,934,454	437,398,569
Sold to local trade and used by employees do	13,871,828	22,081,040	23,601,587	21,889,884	21,989,624	23,262,558	22,121,055
Used at mines for power and heat do	11.670.903	8,765,011	5,727,852	4,930,394	4,602,209	4,662,974	3,992,760
Made into coke at mines do	49,458,320	27,859,316	17,751,549	10,719,633	6,805,222	9,128,607	4,013,915
Total do	478,435,297	564,564,662	573,366,985	517,763,352	500,744,970	534,988,593	467,526,299
Value at mines (total)	$565,235,000	$1,514,621,000	$1,183,412,000	$1,029,657,000	$933,774,000	$952,781,000	$795,483,000
Average sales realization per ton	$1.18	$2.68	$2.06	$1.99	$1.86	$1.78	$1.70
Average spot price, as quoted by Coal Age	$1.23	$2.77	$2.21	$1.99	$1.80	$1.79	$1.75
Number of active mines of commercial size:							
Class 1A (producing 500,000 tons or more)	694	748	174	132	152	209	173
Class 1B (producing 200,000 to 500,000 tons)			649	647	621	618	543
Class 2 (producing 100,000 to 200,000 tons)	837	935	845	818	687	660	608
Class 3 (producing 50,000 to 100,000 tons)	959	1,176	867	879	725	668	644
Class 4 (producing 10,000 to 50,000 tons)	1,558	2,742	1,912	1,831	1,513	1,361	1,239
Class 5 (producing less than 10,000 tons)	1,728	3,730	2,730	2,704	2,752	2,541	2,684
Total	5,776	9,331	7,177	7,011	6,450	6,057	5,891
Per cent of output from mines in classes 1A, 1B, and 2	75.4	70.4	79.1	77.1	80.1	83.1	81.7
Exports to Canada net tons	15,115,733	16,854,257	13,633,513	14,594,297	13,958,961	14,645,001	13,603,118
Exports overseas and all other do	5,029,435	4,599,322	21,638,424	3,417,447	2,205,524	2,784,297	2,274,289
Imports do	1,583,520	1,882,306	485,666	549,843	546,526	495,219	240,886
Consumption (calculated) do	459,874,000	518,993,000	532,581,000	499,801,000	498,828,000	519,555,000	454,990,000
Capacity of mines with existing labor force, assuming 308 working days a year net tons	635,000,000	970,000,000	821,000,000	835,000,000	760,000,000	752,000,000	770,000,000
Average number of days worked	232	179	215	191	203	219	187
Average number of days idle	76	129	93	117	105	89	121
Average number of men employed at mines in operation:							
Miners, loaders, and shot firers	[1] 494,238	422,040	370,292	372.565	329,364	315,678	313,617
Other underground		178,265	140,532	139,541	121,596	118,321	113,125
Surface	[1] 77,644	104,488	82,823	81,812	71,190	68,994	66,460
Total	571,882	704,793	593,647	593,918	522,150	502,993	493,202
Output per man per day net tons	3.61	4.47	4.50	4.55	4.73	4.85	5.06
Output per man per year do	837	801	966	872	959	1,064	948
Per cent of output cut by machine	50.7	66.9	71.7	72.2	73.8	75.4	77.5
Number of power shovels in strip pits	[2] 48	442	410	455	415	411	341
Quantity produced by stripping net tons	[2] 1,280,946	11.844.347	16,922,695	18,378,166	19,788,577	20,268,099	19,842,359

[1] Estimate.

[2] Figures are for 1914, the year of earliest record.

METHODS OF COLLECTING THE STATISTICS

VOLUNTARY COOPERATION

The principal statistics for each State for 1929 and 1930 are given in Table 2. They are based upon written reports from the producers, most of them signed by responsible officers of the operating companies. The reports are collected by correspondence, which is supplemented by visits of field agents if correspondence has failed. The Bureau of Mines has no power to compel the filing of reports.

Under this system accurate results can be obtained only by the generous cooperation of the producers in furnishing reports voluntarily. The operators generally respond cordially to the bureau's questionnaires, with which they have become familiar through 50 years of contact and cooperation, so that a very large percentage of the returns is obtained by mail, leaving relatively few to be collected by personal visits.

COMPLETENESS OF THE RETURNS

Previous reports of this series have carried a detailed account of the mines included and the methods used by the Bureau of Mines in collecting statistics in its annual canvass.[4] In the present report it is sufficient to point out that it is believed that virtually complete returns are received every year for all mines, big and little, that ship by rail or water, and for all those of commercial size that serve a purely local market. The figures, however, do not purport to cover the thousands of country banks and small wagon mines from which coal is mined in quantities less than 1,000 tons a year. The cost of such a count would be prohibitive, without adding materially to the value of the report. In the past, when attempts were made to obtain data on these coal banks regularly, the maximum total output reported for them was about 1,000,000 tons a year, a quantity too small to justify the cost of collecting the information.

UNITS OF MEASUREMENT

The past year brought a notable advance toward the establishment of a uniform unit of measurement in the coal trade. Early in 1931 the Pennsylvania anthracite operators announced the adoption of the net ton. With the anthracite industry now definitely committed to the 2,000-pound unit, this leaves comparatively few instances where the gross ton still remains in use. As the use of both units has always been a matter of confusion it is to be hoped that the pressure of growing sentiment will soon lead to the general adoption of the net ton.

In the present report the standard unit of measurement is the net or short ton of 2,000 pounds, but as Pennsylvania anthracite throughout 1930 was mined and sold by the gross or long ton (2,240 pounds), that unit is used in the section of the report dealing with anthracite. Unless otherwise expressly stated the word "ton" as here used means the net ton, to which all other figures, however reported, have been converted. This practice is the same that has been followed in the past. With subsequent reports the net ton will be used throughout.

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[4] Tryon, F. G., and Mann, L., Coal: Mineral Resources of the United States, 1929, Pt. II, Bureau of Mines, pp. 690-692.

ANTHRACITE, BITUMINOUS COAL, AND LIGNITE

Two industries.—In the statistical reports of the Bureau of Mines the anthracite industry of Pennsylvania and the bituminous-coal industry are listed separately. Both produce coal, and between them there is a certain degree of competition, especially in the sale of the anthracite steam sizes; but the differences in corporate organization, in railroad relations, in geographic position, in natural conditions of mining, in marketing practices, in methods of preparing the coal for the market, and in the nature of the demand are so pronounced that they require separate treatment.

Pennsylvania anthracite industry.—The Pennsylvania anthracite industry, as understood in the trade and as used in this report, is confined to a narrow area of 480 square miles in eastern Pennsylvania. It includes the familiar Lehigh, Schuylkill, and Wyoming regions and also the little outlying Bernice Basin in Sullivan County. In this sharply restricted region are concentrated mines that in 1930 employed 151,000 men and produced 69,385,000 net tons of coal.

Hard coal mined outside of Pennsylvania.—The statistics of the bituminous-coal industry published in this and in preceding reports include anthracite and semianthracite mined outside of Pennsylvania. Such coals are commercially produced in the Crested Butte field of Colorado, in the Los Cerrillos area of New Mexico, in the Spadra and Russellville districts of Arkansas, and in that portion of the Valley coal fields of Virginia lying in Montgomery and Pulaski Counties. The operations in these areas are in no way connected with the close-knit anthracite industry of Pennsylvania. They are affiliated rather with the bituminous industry in their respective States and have therefore been included with the bituminous operations in the statistical record.

However, in view of the growing tonnage of hard coal mined outside of Pennsylvania and the present interest in all fuels available for house heating—to which this coal is admirably adapted—special attention is given to statistics covering the hard-coal output of Arkansas, Colorado, New Mexico, and Virginia on pages 721 to 726 of this report. The total production increased from 363,324 tons in 1913 to 708,221 tons in 1930.

Lignite.—The statistics of the bituminous-coal industry published in this report include lignite. In the classification of coals adopted by the United States Geological Survey the "black lignites" mined in the far West are termed "subbituminous coals." True lignite, although occurring in enormous amounts in the northern Great Plains and Gulf coast geological provinces, is as yet little mined in the United States. The production in 1930 was about 2,529,000 tons, of which 1,700,000 was mined in North Dakota, 13,000 in South Dakota, 66,000 in eastern Montana, and 750,000 in the lignite area of Texas. Although the producers of this coal have certain problems in common they do not form a separate national interest, as does the brown-coal industry of Germany. At present, the statistics on lignite can best be combined with those for bituminous coal.

GROWTH OF INDUSTRY

HISTORICAL SUMMARY

TABLE 5.—*Growth of the bituminous coal-mining industry, 1890–1930*

Year	Production (millions of net tons)	Value (millions of dollars)	Men employed (thousands)	Calculated capacity (millions of net tons)		Average number of days worked	Average number of days lost on account of—			Value per ton	Net tons per man		Per cent cut by machine	Mined by stripping (millions of net tons)[1]
				At 308 days	At 280 days		Strikes	Other causes	Total lost		Per day	Per year		
1890	111	110	192	152	137	226	(2)	(2)	82	$0.99	2.56	579	(2)	(2)
1891	118	117	206	163	148	223	(2)	(2)	85	.99	2.57	573	5.3	(2)
1892	127	125	213	178	162	219	(2)	(2)	89	.99	2.72	596	(2)	(2)
1893	128	123	230	194	174	204	(2)	(2)	104	.96	2.73	557	(2)	(2)
1894	119	108	245	214	196	171	(2)	(2)	137	.91	2.84	486	(2)	(2)
1895	135	116	240	215	196	194	(2)	(2)	114	.86	2.90	563	(2)	(2)
1896	138	115	244	221	202	192	(2)	(2)	116	.83	2.94	564	11.9	(2)
1897	148	120	248	232	213	196	(2)	(2)	112	.81	3.04	596	15.3	(2)
1898	167	133	256	243	221	211	(2)	(2)	97	.80	3.09	651	19.5	(2)
1899	193	168	271	254	230	234	8	66	74	.87	3.05	713	22.7	(2)
1900	212	221	304	279	255	234	5	69	74	1.04	2.98	697	24.9	(2)
1901	226	236	340	309	281	225	2	81	83	1.05	2.94	664	25.6	(2)
1902	260	291	370	348	316	230	7	71	78	1.12	3.06	703	26.8	(2)
1903	283	352	416	387	350	225	3	80	83	1.24	3.02	680	27.6	(2)
1904	279	306	438	425	386	202	8	98	106	1.10	3.15	637	28.2	(2)
1905	315	335	461	460	417	211	2	95	97	1.06	3.24	684	32.8	(2)
1906	343	381	478	496	451	213	28	67	95	1.11	3.36	717	34.7	(2)
1907	395	451	513	520	473	234	1	73	74	1.14	3.29	769	35.1	(2)
1908	333	374	516	531	482	193	11	104	115	1.12	3.34	644	37.0	(2)
1909	380	405	543	560	510	209	1	98	99	1.07	(2)	(2)	37.5	(2)
1910	417	469	556	592	538	217	35	56	91	1.12	3.46	751	41.7	(2)
1911	406	451	550	593	538	211	2	95	97	1.11	3.50	738	43.9	(2)
1912	450	518	549	622	566	223	10	75	85	1.15	3.68	820	46.8	(2)
1913	478	565	572	635	577	232	5	71	76	1.18	3.61	837	50.7	(2)
1914	423	493	584	668	608	195	19	94	113	1.17	3.71	724	51.7	1.3
1915	443	502	557	672	610	203	4	101	105	1.13	3.91	794	55.0	2.8
1916	503	665	561	673	613	230	4	74	78	1.32	3.90	896	56.5	3.9
1917	552	1,249	603	699	636	243	4	61	65	2.26	3.77	915	55.5	5.8
1918	579	1,492	615	717	650	249	1	58	59	2.58	3.78	942	55.9	8.3
1919	466	1,161	622	736	669	195	25	88	113	2.49	3.84	749	59.2	5.6
1920	569	2,130	640	796	725	220	6	82	88	3.75	4.00	881	59.8	8.9
1921	416	1,200	664	860	781	149	3	156	159	2.89	4.20	627	65.6	4.7
1922	422	1,275	688	916	832	142	78	88	166	3.02	4.28	609	63.2	9.9
1923	565	1,515	705	970	885	179	2	127	129	2.68	4.47	801	66.9	11.8
1924	484	1,063	620	871	792	171	7	130	137	2.20	4.56	781	69.5	13.6
1925	520	1,060	588	822	748	195	2	111	113	2.04	4.52	884	70.6	16.9
1926	573	1,183	594	821	747	215	1	92	93	2.06	4.50	966	71.7	16.9
1927	518	1,030	594	835	759	191	45	72	117	1.99	4.55	872	72.2	18.4
1928	501	934	522	760	691	203	8	97	105	1.86	4.73	959	73.8	19.8
1929	535	953	503	752	679	219	(3)	89	89	1.78	4.85	1,064	75.4	20.3
1930	468	795	493	770	700	187	2	119	121	1.70	5.06	948	77.5	19.8

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[1] For the years 1914 to 1923, inclusive, the figures of quantity mined by stripping do not include a small amount which was stripped by some other means than steam shovels, so for these years the tonnages are slightly less than the total recovered by stripping shown in some of the tables in earlier reports of this series.

[2] No data.

[3] Less than one-half day.

TABLE 6.—*Growth of the anthracite-mining industry, 1890–1930*

Year	Production (millions of gross tons)	Value (millions of dollars)	Employees (thousands)	Calculated capacity at 303.5 days (millions of gross tons)	Average number of days worked	Net tons per man		Washery and dredge shipments (millions of gross tons)	Per cent of shipments that were domestic sizes (excluding pea)[1]	Per cent of total shipments that came from [2]—		
						Per day	Per year			Lehigh region	Schuylkill region	Wyoming region
1890	41	66	126	63	200	1.85	369	(3)	76.9	17.3	29.7	53.0
1891	45	74	126	68	203	1.98	401	0.1	75.7	15.8	31.5	52.7
1892	47	82	129	72	198	2.06	407	.1	76.0	15.4	30.1	54.5
1893	48	86	133	74	197	2.06	406	.2	74.9	16.0	28.7	55.3
1894	46	78	132	74	190	2.08	395	.6	73.7	16.2	29.1	54.7
1895	52	82	143	80	196	2.07	406	1.1	69.9	15.7	30.7	53.6
1896	49	82	149	85	174	2.10	365	.9	70.3	15.0	30.4	54.6
1897	47	79	150	95	150	2.34	351	1.0	68.5	15.0	29.3	55.7
1898	48	75	146	95	152	2.41	367	1.1	67.3	14.9	28.8	56.3
1899	54	88	140	95	173	2.50	433	1.4	66.1	14.4	29.8	55.8
1900	51	86	144	94	166	2.40	398	2.1	64.7	15.3	30.0	54.7
1901	60	113	145	93	196	2.37	464	2.6	64.2	13.5	29.9	56.6
1902	37	76	148	97	116	2.40	279	2.0	61.0	11.1	27.2	61.7
1903	67	152	150	98	206	2.41	496	3.6	63.6	12.1	27.7	60.2
1904	65	139	156	99	200	2.35	469	2.8	62.0	12.4	28.5	59.1
1905	69	142	165	98	215	2.18	470	2.6	60.9	12.8	28.8	58.4
1906	64	132	162	99	195	2.25	439	3.8	59.1	12.6	28.8	58.6
1907	76	164	167	106	220	2.33	512	4.3	58.6	12.4	30.0	57.6
1908	74	158	174	113	200	2.39	478	3.6	59.3	12.0	27.9	60.1
1909	72	149	(4)	107	205	(4)	(4)	3.7	58.3	12.2	27.2	60.6
1910	75	161	169	100	229	2.17	498	3.3	58.6	13.3	27.5	59.2
1911	81	175	173	100	246	2.13	524	3.2	59.4	13.9	27.4	58.7
1912	75	178	174	99	231	2.10	485	3.2	60.8	13.6	28.2	58.2
1913	82	195	176	97	257	2.02	520	2.1	61.7	14.4	27.4	58.2
1914	81	188	180	101	245	2.06	505	1.7	61.4	14.7	26.3	59.0
1915	79	185	177	105	230	2.19	504	2.5	60.1	14.9	26.5	58.6
1916	78	202	160	94	253	2.16	548	3.1	60.5	14.1	29.3	56.6
1917	[5] 89	284	154	95	285	[5] 2.27	[5] 646	5.4	61.0	14.9	28.6	56.5
1918	[5] 88	336	147	92	293	[5] 2.29	[5] 672	6.6	60.1	15.1	28.9	56.0
1919	79	365	155	90	266	2.14	570	3.3	64.2	15.5	28.5	56.0
1920	[5] 80	434	145	90	271	[5] 2.28	[5] 618	5.0	63.1	14.6	30.4	55.0
1921	81	452	160	91	271	2.09	567	1.6	66.5	13.5	28.9	57.6
1922	[5] 49	274	157	98	151	[5] 2.31	[5] 349	3.2	62.9	13.9	31.8	54.3
1923	83	507	158	95	268	2.21	592	4.1	63.7	13.9	30.4	55.7
1924	79	477	160	87	274	2.00	550	1.4	65.3	13.5	28.5	58.0
1925	55	328	160	92	182	2.12	386	1.4	66.4	14.0	29.1	56.9
1926	75	474	165	94	244	2.09	511	1.4	66.7	14.0	28.3	57.7
1927	72	421	165	96	225	2.15	485	1.8	63.3	14.0	30.0	56.0
1928	67	394	161	94	217	2.17	469	1.7	61.8	13.4	30.5	56.1
1929	66	386	152	89	225	2.16	487	1.0	62.6	14.1	28.2	57.7
1930	62	355	151	80	208	2.21	460	1.2	61.3	13.9	31.1	55.0

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[1] Excludes Sullivan County and dredge coal.

[2] Includes dredge shipments, 1914–1929.

[3] Less than one-tenth million tons.

[4] No data.

[5] Years of heavy washery output.

RELATIVE RATE OF GROWTH OF COAL AND OTHER SOURCES OF POWER

In spite of the business depression the national production of energy during the year 1930 was 28.4 per cent greater than in 1921, the year of the last major depression. In 1930 the total supply of available energy in the form of coal, oil, natural gas, and water power was 23,842 trillion British thermal units, as against 18,563 in 1921. In comparison with the high mark established in 1929 (26,534 trillion B. t. u.) the year 1930 shows a decrease of only 10.1 per cent, which is less of a decline than many observers would have expected. In other words, even under the conditions of 1930 the national production of energy materials came within 10.1 per cent of what it was during the boom year 1929 (fig. 39).

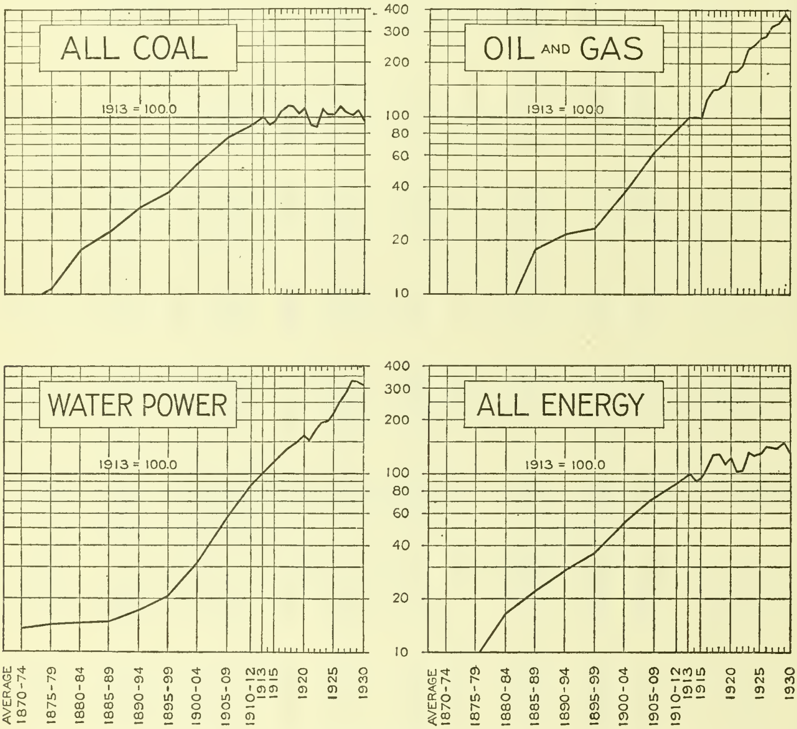

FIGURE 39.—Relative rate of growth of annual supply of coal, oil and gas, and water power in the United States, 1870–1930

The figures are expressed in B. t. u. because some common denominator is necessary for such unlike quantities as tons of coal, barrels of oil, and cubic feet of gas. Table 7 summarizes the B. t. u. equivalent of each of the fuels. Water power is represented by the equivalent of the fuel necessary to perform the same work, assuming a low thermal efficiency.

TABLE 7.—*Annual supply of energy from mineral fuels and water power in the United States, 1819–1930*

[Figures represent trillions of British thermal units and because of rounding do not always add across exactly. In calculating thermal equivalents, the gross British thermal unit values are used. Water power is represented by British thermal units of coal necessary to produce the same amount of power. Figures represent production except those for oil imports and take no account of changes of stock]

Year	Anthracite	Bituminous coal	Total coal	Domestic oil (total crude, including that refined)	Natural gas (total production)	Imported oil (total crude, including that refined)	Total oil and gas	Total mineral fuels	Water power	Grand total, including water power
1819	(1)	--------	(1)	--------	--------	--------	--------	(1)	(2)	(2)
1829	4	3	6	--------	--------	--------	--------	6	(2)	(2)
1839	27	41	68	--------	--------	--------	--------	68	(2)	(2)
1849	109	64	173	--------	--------	--------	--------	173	(2)	(2)
1859	262	158	419	(1)	--------	--------	--------	419	(2)	(2)
1869	464	415	879	25	--------	--------	25	904	(2)	(2)
1879	822	993	1,815	119	(1)	--------	119	1,934	(2)	(2)
1889	1,239	2,507	3,746	211	[3] 268	--------	479	4,225	91	4,316
1899	1,643	5,065	6,708	342	[3] 240	--------	582	7,291	135	7,426
1909	2,205	9,949	12,155	1,099	517	(4)	1,616	13,771	411	14,182
1913	2,490	12,535	15,025	1,491	626	102	2,219	17,243	588	17,831
1918	2,688	15,180	17,868	2,136	775	226	3,137	21,005	837	21,842
1919	2,396	12,206	14,602	2,270	802	317	3,389	17,991	892	18,883
1920	2,437	14,899	17,336	2,658	858	637	4,153	21,489	971	22,460
1921	2,461	10,897	13,358	2,833	712	752	4,297	17,655	908	18,563
1922	1,487	11,063	12,551	3,345	820	764	4,929	17,480	1,024	18,504
1923	2,539	14,791	17,330	4,394	1,082	492	5,968	23,298	1,136	24,434
1924	2,392	12,672	15,064	4,284	1,227	467	5,978	21,042	1,167	22,209
1925	1,681	13,625	15,306	4,582	1,278	371	6,231	21,537	1,290	22,827
1926	2,297	15,022	17,319	4,625	1,411	362	6,398	23,717	1,492	25,209
1927	2,179	13,565	15,744	5,407	1,553	350	7,310	23,054	1,687	24,741
1928	2,049	13,120	15,169	5,409	1,686	479	7,574	22,743	1,942	24,685
1929	2,008	14,017	16,025	6,044	2,062	474	8,580	24.605	1,929	26,534
1930	1,887	12,249	14,136	5,388	2,089	373	7,850	21,986	1,856	23,842

[1] Less than 0.5.

[2] No figures for water power are available before 1889. The fuel equivalent for water power is calculated from the reported horsepower of installed water wheels, assuming a capacity factor of 20 per cent for manufactures and mines and of 40 per cent for public utilities and assuming that the theoretical thermal equivalent of 1 horsepower-hour (2,547 B. t. u.) is 7 per cent of the B. t. u. that would have been consumed in generating 1 horsepower-hour from fuels in practice. For 1919 to 1930, however, actual reports of the horsepower-hours produced by water in electric-utility plants, as recorded by the U. S. Geological Survey, have been used.

[3] Based on the amount of coal displaced by gas, as estimated by the gas companies at the time.

[4] Imports negligible before 1913.

It is very important to note that the figures for "domestic oil," as in earlier issues of these tables, represent the entire production of crude petroleum. They include, therefore, not only energy used in the form of fuel oil under boilers, and consequently competing more or less directly with coal, but also the energy used in the form of gasoline, kerosene, and other refined products. Even these refined products involve a measure of indirect competition with coal, for the energy market of the country is becoming more and more fluid and competitive, and a demand which can not be met by one source of supply tends to fall back on the others. The purpose of these tables is to measure the total demand for energy.

To make comparisons easier the figures of heat units are reduced to index numbers in Table 8, taking 1918 as 100. In comparison with the boom year 1929, all sources of the energy supply show a decrease except natural gas, the production of which increased from index 266 to index 270. a gain of 4 points or 1.5 per cent. (See fig. 40.)

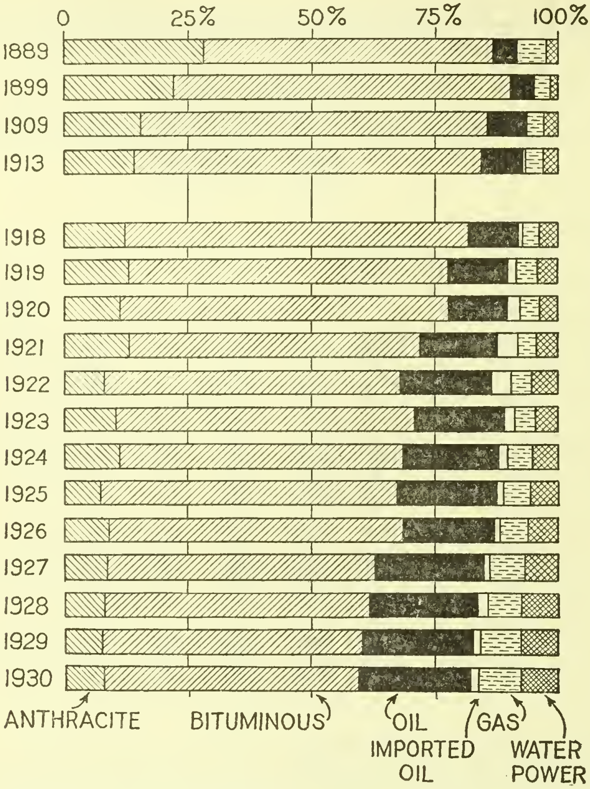

Figure 40.—Percentage of the energy supply of the United States derived from coal, oil and gas, and water power, 1889–1930

TABLE 8.—*Relative rate of growth of coal, oil, and water power in the United States 1819–1930*

[The figures for 1918 are represented by the number 100, and the figures for all other years are expressed as a percentage of the 1918 rate]

Year	Anthracite	Bituminous coal	Total coal	Domestic oil (total crude, including that refined)	Natural gas (total production)	Imported oil (total crude, including that refined)	Total oil and gas	Total mineral fuels	Water power	Grand total, including water power
1819	(1)	--------	(1)	--------	--------	--------	--------	(1)	(2)	(2)
1829	(1)	(1)	(1)	--------	--------	--------	--------	(1)	(2)	(2)
1839	1	(1)	(1)	--------	--------	--------	--------	(1)	(2)	(2)
1849	4	(1)	1	--------	--------	--------	--------	1	(2)	(2)
1859	10	1	2	(1)	--------	--------	(1)	2	(2)	(2)
1869	17	3	5	1	--------	--------	1	4	(2)	(2)
1879	31	6	10	6	(1)	--------	4	9	(2)	(2)
1889	46	17	21	10	35	--------	15	20	11	20
1899	61	33	37	16	31	--------	19	35	16	34
1909	82	66	68	51	67	(3)	52	66	49	65
1913	93	83	84	70	81	45	71	82	70	82
1918	100	100	100	100	100	100	100	100	100	100
1919	89	80	81	106	103	140	108	86	107	86
1920	91	98	97	124	111	282	132	102	116	103
1921	92	72	74	132	92	333	137	84	109	85
1922	55	73	70	156	106	338	157	83	122	85
1923	94	97	97	206	140	218	191	111	136	112
1924	89	83	84	201	158	207	191	100	139	102
1925	63	90	86	215	165	164	199	103	154	105
1926	85	99	97	217	182	160	204	113	178	115
1927	81	89	88	253	201	155	233	110	202	113
1928	76	86	85	253	218	212	241	108	232	113
1929	75	92	90	283	266	210	274	117	230	121
1930	70	81	79	252	270	165	250	105	222	109

[1] Less than 0.5. [2] No data for water power prior to 1889. [3] Imports negligible prior to 1913.

TABLE 9.—*Per cent of total heating value contributed by the several mineral fuels in the United States, 1819–1930*

Year	Anthracite	Bituminous coal	Total coal	Domestic oil (total crude, including that refined)	Natural gas (total production)	Imported oil (total crude, including that refined)	Total oil and gas	Total mineral fuels	Water power, per cent of fuels[1]
1819	100.0	--------	100.0	--------	--------	--------	--------	100.0	(1)
1829	58.4	41.6	100.0	--------	--------	--------	--------	100.0	(1)
1839	40.2	59.8	100.0	--------	--------	--------	--------	100.0	(1)
1849	62.8	37.2	100.0	--------	--------	--------	--------	100.0	(1)
1859	62.3	37.7	100.0	(2)	--------	--------	--------	100.0	(1)
1869	51.3	45.9	97.2	2.8	(2)	--------	2.8	100.0	(1)
1879	42.5	51.3	93.8	6.2	(2)	--------	6.2	100.0	(1)
1889	29.3	59.3	88.6	5.0	6.4	--------	11.4	100.0	2.2
1899	22.5	69.5	92.0	4.7	3.3	--------	8.0	100.0	1.9
1909	16.0	72.2	88.2	8.0	3.8	(2)	11.8	100.0	3.0
1913	14.4	72.7	87.1	8.7	3.6	0.6	12.9	100.0	3.4
1918	12.8	72.3	85.1	10.1	3.7	1.1	14.9	100.0	4.0
1919	13.3	67.9	81.2	12.6	4.5	1.7	18.8	100.0	5.0
1920	11.4	69.3	80.7	12.4	4.0	2.9	19.3	100.0	5.0
1921	14.0	61.7	75.7	16.0	4.0	4.3	24.3	100.0	5.1
1922	8.5	63.3	71.8	19.1	4.7	4.4	28.2	100.0	5.9
1923	10.9	63.5	74.4	18.9	4.6	2.1	25.6	100.0	4.9
1924	11.4	60.2	71.6	20.4	5.8	2.2	28.4	100.0	5.5
1925	7.8	63.3	71.1	21.3	5.9	1.7	28.9	100.0	6.0
1926	9.7	63.3	73.0	19.5	6.0	1.5	27.0	100.0	6.3
1927	9.5	58.8	68.3	23.5	6.7	1.5	31.7	100.0	7.3
1928	9.0	57.7	66.7	23.8	7.4	2.1	33.3	100.0	8.5
1929	8.1	57.0	65.1	24.6	8.4	1.9	34.9	100.0	7.8
1930	8.6	55.7	64.3	24.5	9.5	1.7	35.7	100.0	8.4

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[1] No figures for water power are available before 1889; hence to make the figures comparable the data for water power thereafter are expressed as per cent of the fuel total but are not included in the base on which the percentages are computed.

[2] Less than 0.1 per cent.

PRODUCTION

PRODUCTION SUMMARIES, BY STATES

TABLE 10.—*Comparison of bituminous coal produced, by States, 1913, 1923, 1929, and 1930*

State	Production (net tons)				Per cent of increase or decrease		
	1913	1923	1929	1930	1913–1930	1923–1930	1929–1930
Alabama	17,678,522	20,457,649	17,943,923	15,570,058	−11.9	−23.9	−13.2
Arkansas	2,234,107	1,296,892	1,695,108	1,533,434	−31.4	+18.2	−9.5
Colorado	9,232,510	10,346,218	9,920,741	8,196,910	−11.2	−20.8	−17.4
Georgia	255,626	75,620	44,636	7,092	−97.2	−90.6	−84.1
Illinois	61,618,744	79,310,075	60,657,641	53,731,230	−12.8	−32.3	−11.4
Indiana	17,165,671	26,229,099	18,344,358	16,489,962	−3.9	−37.1	−10.1
Iowa	7,525,936	5,710,735	4,241,069	3,892,571	−48.3	−31.8	−8.2
Kansas	7,202,210	4,443,149	2,975,971	2,429,929	−66.3	−45.3	−18.3
Kentucky	19,616,600	44,777,317	60,462,600	51,208,995	+161.0	+14.4	−15.3
Maryland	4,779,839	2,285,926	2,649,114	2,270,593	−52.5	−.7	−14.3
Michigan	1,231,786	1,172,075	804,869	661,113	−46.3	−43.6	−17.9
Missouri	4,318,125	3,403,151	4,030,311	3,853,150	−10.8	+13.2	−4.4
Montana	3,240,973	3,147,678	3,407,526	3,022,004	−6.8	−4.0	−11.3
New Mexico	3,708,806	2,915,173	2,622,769	1,969,433	−46.9	−32.4	−24.9
North Dakota	495,320	1,385,400	1,862,130	1,700,157	+243.2	+22.7	−8.7
Ohio	36,200,527	40,546,443	23,689,477	22,551,978	−37.7	−44.4	−4.8
Oklahoma	4,165,770	2,885,038	3,774,080	2,793,954	−32.9	−3.2	−26.0
Pennsylvania	173,781,217	171,879,913	143,516,241	124,462,787	−28.4	−27.6	−13.3
South Dakota	10,540	10,379	12,854	12,810	+21.5	+23.4	−.3
Tennessee	6,860,184	6,040,268	5,405,464	5,130,428	−25.2	−15.1	−5.1
Texas	2,429,144	1,187,329	1,100,668	833,872	−65.7	−29.8	−24.2
Utah	3,254,828	4,720,217	5,160,521	4,257,541	+30.8	−9.8	−17.5
Virginia	8,828,068	11,761,643	12,748,306	10,907,377	+23.6	−7.3	−14.4
Washington	3,877,891	2,926,392	2,521,327	2,301,928	−40.6	−21.3	−8.7
West Virginia	71,254,136	107,899,941	138,518,855	121,472,638	+70.5	+12.6	−12.3
Wyoming	7,393,066	7,575,031	6,704,790	6,088,133	−17.7	−19.6	−9.2
Other States	75,151	175,911	173,244	176,222	+134.5	+.2	+1.7
	478,435,297	564,564,662	534,988,593	467,526,299	−2.3	−17.2	−12.6

TABLE 11.—*Coal produced in 1930, by States, and highest recorded production*

State	1930 (net tons)	Maximum production	
		Year	Net tons
Alabama	15,570,058	1926	21,000,962
Alaska	120,100	1928	126,100
Arkansas	1,533,434	1907	2,670,438
California, Idaho, and Oregon	[1] 27,622	1880	280,155
Colorado	8,196,910	1917	12,483,336
Georgia	7,092	1903	416,951
Illinois	53,731,230	1918	89,291,105
Indiana	16,489,962	1918	30,678,634
Iowa	3,892,571	1917	8,965,830
Kansas	2,429,929	1918	7,561,947
Kentucky	51,208,995	1927	69,123,998
Maryland	2,270,593	1907	5,532,628
Michigan	661,113	1907	2,035,858
Missouri	3,853,150	1917	5,670,549
Montana	3,022,004	1918	4,532,505
New Mexico	1,969,433	1918	4,023,239
North Carolina	28,500	1922	78,570
North Dakota	1,700,157	1929	1,862,130
Ohio	22,551,978	1920	45,878,191
Oklahoma	2,793,954	1920	4,849,288
Pennsylvania bituminous	124,462,787	1918	178,550,741
South Dakota	12,810	1925	14,447
Tennessee	5,130,428	1910	7,121,380
Texas	833,872	1913	2,429,144
Utah	4,257,541	1920	6,005,199
Virginia	10,907,377	1926	14,133,386
Washington	2,301,928	1918	4,082,212
West Virginia	121,472,638	1927	145,122,447
Wyoming	6,088,133	1920	9,630,271
Pennsylvania anthracite	69,384,837	1917	99,611,811

[1] Includes Arizona.

TOTAL PRODUCTION SINCE BEGINNING OF MINING

TABLE 12.—*Coal produced, by States, 1918–1930, with cumulative total production from the earliest record to the end of 1930, in thousands of net tons*

State	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	Total production from earliest record to end of 1930
Alabama	19, 185	15, 537	16, 294	12, 569	18, 325	20, 458	19, 130	20, 004	21, 001	19, 766	17, 621	17, 944	15, 570	557. 034
Arkansas	2, 227	1, 429	2, 103	1, 228	1, 110	1, 297	1, 452	1, 220	1, 459	1, 549	1, 661	1, 695	1, 533	64, 150
Colorado	12, 408	10, 323	12, 278	9, 123	10, 020	10, 346	10, 444	10, 311	10, 637	9, 724	9, 848	9, 921	8, 197	348, 705
Georgia	67	53	50	34	61	76	75	66	60	77	58	45	7	10, 747
Illinois	89, 291	60, 863	88, 725	69, 603	58, 468	79, 310	68, 323	66, 909	69, 367	46, 848	55, 948	60, 658	53, 731	2, 102, 374
Indiana	30, 679	20, 912	29, 351	20, 319	19, 133	26, 229	21, 480	21, 225	23, 186	17, 936	16, 379	18, 344	16, 490	613, 575
Iowa	8, 192	5, 625	7, 814	4, 531	4, 335	5, 711	5, 468	4, 715	4, 626	2, 950	3, 684	4, 241	3, 893	283, 679
Kansas	7, 562	5, 225	5, 926	3, 467	2, 955	4, 443	4, 248	4, 524	4, 416	3, 444	2, 810	2, 976	2, 430	211. 875
Kentucky	31, 613	30, 036	35, 691	31, 588	42, 134	44, 777	45, 147	55, 069	62. 924	69. 124	61, 860	60, 463	51, 209	924. 711
Maryland	4, 497	3, 022	4, 065	1, 828	1, 223	2, 286	2, 134	2, 695	3, 078	2, 815	2, 687	2, 649	2, 271	228, 423
Michigan	1, 465	996	1, 490	1, 142	929	1, 172	831	808	687	757	617	805	661	40, 266
Missouri	5, 668	3, 980	5, 370	3, 551	2, 925	3, 403	2, 481	2, 694	3, 008	3, 064	3, 733	4, 030	3, 853	186, 089
Montana	4, 532	3, 236	4, 414	2, 734	2, 572	3, 148	2, 905	3, 044	2, 798	3, 144	3, 324	3, 408	3, 022	97, 135
New Mexico	4, 023	3, 139	3, 683	2, 453	3, 147	2, 915	2, 786	2, 557	2, 818	2, 935	2, 712	2, 623	1, 969	94, 768
North Carolina	1	7	12	23	78	36	57	65	58	53	61	52	29	1, 011
North Dakota	720	841	949	865	1, 327	1, 385	1, 200	1, 325	1, 370	1, 528	1, 650	1, 862	1, 700	24, 606
Ohio	45, 813	35, 877	45. 878	31, 943	26, 954	40, 547	30, 473	28, 034	27, 873	15, 800	15, 641	23, 689	22, 552	1, 190, 506
Oklahoma	4, 813	3, 802	4, 849	3, 363	2, 803	2, 885	2, 330	2, 326	2, 843	3, 818	3, 501	3, 774	2, 794	119, 052
Oregon	13	18	21	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	[2] 2, 380
Pennsylvania bituminous	178, 551	150, 758	170, 608	116, 014	113, 148	171, 880	130, 634	136, 928	153, 042	132, 965	131, 202	143, 516	124, 463	5, 234, 335
Tennessee	6, 831	5, 213	6, 662	4, 460	4, 877	6, 040	4, 557	5, 454	5, 789	5, 783	5, 611	5, 405	5, 130	219, 568
Texas	2, 261	1, 681	1, 615	973	1, 106	1, 187	1, 147	1, 008	1, 091	1, 326	1, 182	1, 101	834	51, 918
Utah	5, 137	4, 631	6, 005	4, 079	4, 992	4, 720	4, 488	4, 690	4, 374	4, 781	4, 843	5, 161	4, 258	110, 317
Virginia	10. 290	9, 327	11, 379	7, 492	10, 491	11, 762	10, 693	12, 800	14, 133	12, 916	11, 901	12, 748	10, 907	279, 003
Washington	4, 082	2, 990	3, 757	2, 429	2, 581	2, 927	2, 654	2, 538	2, 587	2, 635	2, 520	2, 521	2, 302	113, 524
West Virginia	89, 936	79, 037	89, 971	72, 787	80, 488	107, 900	101, 663	122, 381	143, 509	145. 122	132, 952	138, 519	121, 473	2, 535, 020
Wyoming	9, 439	7, 220	9, 630	7, 201	5. 972	7, 575	6, 757	6, 553	6, 512	6, 754	6, 572	6, 705	6, 088	241, 234
Other States	90	82	77	123	114	150	129	110	121	149	167	134	160	45, 894
Total bituminous	579, 386	465. 860	568, 667	415, 922	422, 268	564, 565	483, 686	520, 053	573, 367	517, 763	500, 745	534, 989	467, 526	15. 931, 899
Pennsylvania anthracite	98, 826	88, 092	89, 598	90, 473	54, 683	93, 339	87, 927	61, 817	84, 437	80, 096	75, 348	73, 828	69, 385	3, 861, 553
Grand total	678, 212	553, 952	658, 265	506, 395	476, 951	657, 904	571, 613	581, 870	657, 804	597, 859	576, 093	608, 817	536, 911	19, 793, 452

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[1] Included under "Other States."

[2] Total through 1920.

PRODUCTION, BY FIELDS

Many requests are received for information on production by trade fields as distinct from States and counties. In Table 13 the operators' reports to the Bureau of Mines have been retabulated according to the 92 fields into which the United States Coal Commission grouped the bituminous-coal mines. Corresponding figures for 1920 and 1921 will be found in Coal in 1923, pages 534 and 535; for 1922 and 1924, in Coal in 1924, pages 471 and 472; for 1925, in Coal in 1925, pages 417 and 418; for 1926, in Coal in 1926, pages 460 and 461; for 1927, in Coal in 1927, pages 354 and 355; for 1928, in Coal in 1928, pages 455 and 456; and for 1929, in Coal in 1929, pages 702 and 703. Data on production by fields in 1917 and 1918 are given in Coal in 1918, Part A, page 705. The grouping of the fields used therein is that adopted for administrative purposes by the United States Fuel Administration and is explained on page 114 of Part I of the Report of the Distribution Division of the Fuel Administration. This grouping differs from that of the United States Coal Commission.

The commission's grouping of the fields was made under the direction of C. E. Lesher and R. A. Walter, primarily with a view to its studies of cost of production. The fields are accurately delimited by metes and bounds on pages 2034 to 2052 of the commission's report. Because all the fields adopted did not coincide with generally accepted trade districts they were designated by number rather than by name. For the convenience of the reader of Table 13, however, the trade name most nearly corresponding to the boundaries established by the commission is also listed.

TABLE 13.—*Bituminous coal produced and number of mines active in the several fields adopted by the U. S. Coal Commission, 1923 and 1930*

[The definitions of these fields are given in detail on pages 2034-2052, Pt. IV of the report of the U. S. Coal Commission]

U. S. Coal Commission field No.	State	General name of field	1923		1930	
			Number of mines	Production (net tons)	Number of mines	Production (net tons)
1	Pennsylvania	Pittsburgh	452	42,209,000	200	31,077,000
2	do	Connellsville	312	37,882,000	122	27,768,000
3	do	Westmoreland-Ligonier	171	14,563,000	77	9,782,000
4a, b	do	Freeport (thick and thin)	123	12,338,000	72	9,148,000
5	do	Butler-Mercer	110	2,587,000	65	1,329,000
6	do	Blossburg	20	496,000	14	216,000
7	do	Broad Top	63	1,430,000	38	1,049,000
8	do	Somerset	232	5,772,000	111	5,949,000
9a	do	Central Pennsylvania, western.	1,385	54,364,000	52	2,346,000
9b	do	Central Pennsylvania, middle.			105	9,181,000
9c	do	Central Pennsylvania, eastern.			480	26,617,000
10	Maryland-West Virginia	Maryland-Potomac	159	3,890,000	108	3,773,000
11	West Virginia	Fairmont	309	22,883,000	125	19,991,000
12	Ohio-West Virginia	Panhandle-Pittsburgh No. 8	233	25,529,000	166	16,587,000
13	do	Pomeroy	41	1,309,000	26	593,000
14	West Virginia	Putnam County	10	345,000	3	358,000
15	Kentucky-West Virginia	Kenova	38	2,103,000	19	2,734,000
16	do	Thacker	89	6,149,000	44	7,554,000
17	West Virginia	Tug River	87	4,555,000	52	7,835,000
18	Virginia-West Virginia	Pocahontas	107	16,481,000	79	18,461,000
19	West Virginia	Winding Gulf	78	7,228,000	61	10,701,000
20	do	New River	145	8,810,000	105	13,246,000
21	do	Kanawha	285	12,741,000	110	15,217,000
22	do	Coal River	29	1,397,000	11	1,922,000
23	do	Logan	155	12,831,000	74	16,806,000
24a	do	Coal and Coke	39	1,158,000	6	765,000
24b	do	Preston County	58	1,937,000	25	1,334,000
24c	do	Taylor County, Junior, Philippi, and Gauley.	176	6,140,000	84	4,161,000

Table 13.—*Bituminous coal produced and number of mines active in the several fields adopted by the U. S. Coal Commission, 1923 and 1930*—Continued

U. S. Coal Commission field No.	State	General name of field	1923		1930	
			Number of mines	Production (net tons)	Number of mines	Production (net tons)
25	Virginia	Southwestern Virginia	123	8, 148, 000	58	6, 969, 000
26	do	Clinch Valley	34	2, 464, 000	16	2, 119, 000
27	do	Virginia "anthracite"	[1] 8	[1] 217, 000	9	239, 000
28	do	Richmond Basin	(1)	(1)	-------	------------
29	Ohio	Massillon-Palmyra-Lisbon	90	2, 815, 000	84	1, 470, 000
30	do	Coshocton-Goshen	155	3, 174, 000	136	1, 673, 000
31	do	Cambridge	55	4, 780, 000	42	2, 455, 000
32	do	Crooksville	60	1, 015, 000	52	597, 000
33	do	Hocking	241	7, 517, 000	86	3, 897, 000
34	do	Jackson and Ironton	89	610, 000	45	445, 000
36	Kentucky	Northeast Kentucky	225	9, 602, 000	105	12, 032, 000
37	do	Hazard	128	6, 660, 000	70	6, 588, 000
38	do	Harlan	75	8, 752, 000	58	13, 051, 000
39	Kentucky-Tennessee	Southern Appalachian	221	6, 765, 000	96	5, 946, 000
40	do	Jellico	55	1, 003, 000	22	573, 000
41	Kentucky	Western Kentucky	172	10, 890, 000	134	10, 915, 000
42	Tennessee	Rockwood-Soddy	89	2, 563, 000	32	1, 887, 000
43	do	Fentress	13	541, 000	7	648, 000
44	Alabama	Big Seam Group	45	5, 954, 000	46	5, 855, 000
45	Alabama-Georgia	Cahaba Group	109	5, 846, 000	86	4, 411, 000
46	Alabama	Pratt Group	137	8, 696, 000	65	5, 312, 000
47	Indiana	Indiana	272	25, 793, 000	147	16, 042, 000
48	do	Brazil Block	29	345, 000	20	448, 000
49	Illinois	Northern Illinois	60	2, 334, 000	43	1, 425, 000
50	do	Fulton-Peoria	119	4, 190, 000	140	3, 785, 000
51	do	Danville	32	4, 178, 000	45	2, 924, 000
52	do	Central Illinois	108	25, 205, 000	80	15, 352, 000
53	do	Belleville	106	10, 193, 000	80	5, 685, 000
54	do	Murphysboro	10	557, 000	7	465, 000
55	do	Southern Illinois	140	32, 595, 000	113	24, 095, 000
56	Michigan	Michigan	13	1, 172, 000	6	661, 000
57	Arkansas	Sebastian	54	906, 000	30	820, 000
58	do	Excelsior-Logan	21	106, 000	30	372, 000
59	do	Arkansas "anthracite"	19	221, 000	17	341, 000
60	Colorado	Colorado "domestic"	145	4, 430, 000	147	3, 461, 000
61	do	Trinidad	44	3, 182, 000	34	1, 947, 000
62	do	Northern Colorado	47	2, 715, 000	37	2, 789, 000
63	Iowa	Marion-Monroe-Polk	89	4, 485, 000	158	2, 873, 000
64	do	Appanoose	62	1, 217, 000	75	1, 020, 000
65	Kansas	Pittsburg	192	4, 135, 000	146	2, 282, 000
66	do	Lightning Creek				
67	do	Osage	27	115, 000	34	66, 000
68	do	Leavenworth [2]	4	137, 000	4	118, 000
69	Missouri	Southern Missouri	[3] 79	[3] 2, 114, 000	112	2, 833, 000
70	do	Lafayette	69	1, 141, 000	101	984, 000
71	do	Grundy	(3)	(3)	(2)	(2)
72	do	Platte	(2)	(2)	(2)	(2)
73	Montana	Montana	48	3, 144, 000	86	3, 022, 000
74	New Mexico	Gallup	13	939, 000	14	921, 000
75	do	Cerrillos and Carthage	11	248, 000	8	177, 000
76	do	Raton	15	1, 678, 000	12	844, 000
76a	do	Monero	3	33, 000	10	27, 000
77	North Dakota	Southern North Dakota	72	910, 000	100	975, 000
78	do	Northern North Dakota	50	447, 000	56	725, 000
79	Oklahoma	McAlester Vein	25	640, 000	18	316, 000
80	do	Oklahoma, eastern	90	2, 200, 000	93	2, 478, 000
81	Texas	Texas (bituminous)	10	175, 000	4	84, 000
82	do	Texas (lignite)	34	1, 012, 000	21	750, 000
83	Utah	Utah	37	4, 720, 000	39	4, 258, 000
84	Washington	Kittitas County	12	1, 358, 000	7	949, 000
85	do	Pierce-King (bituminous)	18	738, 000	17	422, 000
86	do	Subbituminous	26	830, 000	22	931, 000
87	Wyoming	Wyoming	62	7, 559, 000	60	6, 088, 000
88	South Dakota	South Dakota	15	10, 000	17	13, 000
89	Oregon	Oregon	(4)	(4)	(4)	(4)
90	California [4]	California [4]	5	20, 000	8	18, 000
91	Nevada	Nevada	-------	------------	-------	------------
92	North Carolina	North Carolina	2	36, 000	1	29, 000
	Unclassified		12	120, 000	9	129, 000
			9, 331	563, 422, 000	5, 891	467, 526, 000

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[1] Virginia "anthracite" field includes Richmond Basin field (No. 28).

[2] Leavenworth field, Kansas, includes Platte field, Missouri (No. 72) in 1923 and 1930 and Grundy field, Missouri (No. 71) in 1930.

[3] Southern Missouri field includes Grundy field (No. 71).

[4] California includes Idaho and Oregon.

PRODUCTION, BY GEOLOGIC PROVINCES

TABLE 14.—*Production of bituminous coal and lignite, by geologic provinces, in 1913 and 1918–1930, in net tons*

[The production statistics compiled by the Bureau of Mines are usually arranged by States and counties in alphabetical order. In the following table they are regrouped to accord roughly with broad geologic provinces. This grouping will be found useful in studying the degree of exhaustion of the resources and the competitive position of the several fields because the natural conditions that largely control the cost of mining are closely related to the geology]

Province	1913	1918	1919	1920	1921	1922	1923
Northern and Middle Appalachians (Pennsylvania, Ohio, Maryland, West Virginia, Eastern Kentucky, Virginia, and Tennessee)	312, 863, 044	356, 731, 603	304, 636, 935	353, 217, 522	257, 496, 572	265, 580, 998	374, 301, 172
Southern Appalachians (Alabama)	17, 678, 522	19, 184, 962	15, 536, 721	16, 294, 099	12, 568, 899	18, 324, 740	20, 457, 649
Northern Interior (Michigan)	1, 231, 786	1, 464, 818	996, 545	1, 489, 765	1, 141, 715	929, 390	1, 172, 075
Eastern Interior (Illinois, Indiana, and Western Kentucky)	87, 241, 942	130, 768, 429	90, 407, 132	129, 111, 736	98, 538, 128	91, 334, 748	116, 429, 453
Northwestern Interior (Iowa, Missouri, and Kansas)	19, 046, 271	21, 421, 872	14, 829, 214	19, 109, 889	11, 549, 654	10, 215, 081	13, 557, 035
Middle Western Interior (Arkansas and Oklahoma)	6, 399, 877	7, 040, 816	5, 231, 133	6, 952, 884	4, 590, 400	3, 912, 557	4, 181, 930
Southwestern Interior (Texas, bituminous)	1, 247, 988	1, 074, 183	734, 087	545, 227	210, 638	265, 179	175, 332
Gulf Coast (Texas, lignite)	1, 181, 156	1, 186, 952	946, 569	1, 069, 788	762, 201	840, 828	1, 011, 997
Northern Great Plains (North Dakota, lignite)	495, 320	719, 733	840, 959	948, 625	864, 903	1, 327, 564	1, 385, 400
Rocky Mountains (Montana, Wyoming, Colorado, Utah, and New Mexico)	26, 830, 183	35, 538, 828	28, 549, 606	36, 011, 001	25, 589, 650	26, 702, 723	28, 704, 317
Pacific Coast (Washington)	3, 877, 891	4, 082, 212	2, 990, 447	3, 757, 093	2, 428, 722	2, 581, 165	2, 926, 392
Grand total [1]	478, 435, 297	579, 385, 820	465, 860, 058	568, 666, 683	415, 921, 950	422, 268, 099	564, 564, 662

Province	1924	1925	1926	1927	1928	1929	1930
Northern and Middle Appalachians (Pennsylvania, Ohio, Maryland, West Virginia, Eastern Kentucky, Virginia, and Tennessee)	316, 280, 532	351, 173, 229	394, 884, 385	363, 320, 442	345, 577, 581	372, 552, 909	327, 089, 495
Southern Appalachians (Alabama)	19, 130, 184	20, 004, 395	21, 000, 962	19, 765, 866	17, 621, 362	17, 943, 923	15, 570, 058
Northern Interior (Michigan)	831, 020	808, 233	686, 707	756, 763	617, 342	804, 869	661, 113
Eastern Interior (Illinois, Indiana, and Western Kentucky)	98, 823, 565	100, 320, 882	108, 016, 952	85, 988, 572	88, 603, 995	93, 439, 147	81, 136, 493
Northwestern Interior (Iowa, Missouri, and Kansas)	12, 197, 063	11, 933, 309	12, 050, 462	9, 457, 727	10, 225, 780	11, 247, 351	10, 175, 650
Middle Western Interior (Arkansas and Oklahoma)	3, 781, 118	3, 545, 879	4, 301, 690	5, 366, 888	5, 162, 298	5, 469, 188	4, 327, 388
Southwestern Interior (Texas, bituminous)	163, 196	182, 680	170, 494	156, 899	117, 849	109, 606	84, 322
Gulf Coast (Texas, lignite)	983, 815	825, 695	920, 664	1, 169, 486	1, 064, 185	991, 062	749, 550
Northern Great Plains (North Dakota, lignite)	1, 200, 527	1, 324, 620	1, 370, 244	1, 527, 939	1, 649, 930	1, 862, 130	1, 700, 157
Rocky Mountains (Montana, Wyoming, Colorado, Utah, and New Mexico)	27, 381, 151	27, 154, 662	27, 138, 989	27, 338, 388	27, 297, 980	27, 816, 347	23, 534, 021
Pacific Coast (Washington)	2, 653, 667	2, 537, 890	2, 586, 568	2, 635, 062	2, 519, 901	2, 521, 327	2, 301, 928
Grand total [1]	483, 686, 538	520, 052, 741	573, 366, 985	517, 763, 352	500, 744, 970	534, 988, 593	467, 526, 299

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[1] Totals include Alaska, Arizona, California, Georgia, Idaho, Nebraska, Nevada, North Carolina, Oregon, and South Dakota, which are not covered by the group totals above.

PRODUCTION, BY WEEKS AND MONTHS

The following tables summarize the statistics of the weekly and monthly production of bituminous coal that are first published in the Bureau of Mines weekly coal reports. The figures given are estimates based upon daily and weekly reports of cars of coal and beehive coke loaded by the principal railroads and of shipments over the Monongahela, Allegheny, Ohio, and Kanawha Rivers. The estimates are afterwards revised to agree with the results of the annual statistical reports from the producers of coal; therefore, the figures given here differ slightly from the estimates originally issued in the weekly reports.

If production in February, with 28 days, is compared to that in January, with 31 days, a downward drop is often seen, which may give a mistaken impression as to the real trend. A better indication is afforded by the average production per working day, and it is the practice of the Bureau of Mines in tables of monthly or weekly coal production to show the average per working day as well as the total for the period. Christmas and Fourth of July are universally observed at the mines. A number of other holidays are observed in some districts but not in others. New Year's Day is very generally observed, but in 1930 so many mines continued at work on that day that over the country, as a whole, the day counted for four-tenths of a normal working day. February 22, on the other hand, is little observed as a holiday. Table 16 shows the allowances made in the bureau's records for holidays at the bituminous mines in the last eight years. These allowances are made in the light of the daily reports of cars of coal loaded, collected by the American Railway Association. Loadings on the holiday are compared with those on the corresponding day of the weeks immediately preceding and following, and the degree of holiday observance is computed accordingly. After allowing for the observance of holidays the weighted average potential working year for the country, as a whole, in 1930, was 307.1 days.

As may be seen from Table 15, the weekly rate of production during the first few weeks of the year averaged well above 10,000,000 tons and was not far below that of the corresponding period of the previous year. Toward the middle of February, however, production turned abruptly downward and throughout the remainder of the year fell conspicuously under the 1929 level. A low point was reached during the week ended March 22, when the daily rate of output averaged only 1,322,000 tons. A slight upturn occurred at the beginning of the new coal year, but this was followed by a relapse that extended until the end of the summer, when the rate of output again began to climb. Only for a brief interval in late October and early November, however, was the 10,000,000-tons-a-week mark again touched, and the year ended with production once more trending downward.

TABLE 15.—*Estimated weekly production of bituminous coal in 1930*

Week ended	Production net (tons)	Number of working days	Average production per working day (net tons)	Week ended	Production net (tons)	Number of working days	Average production per working day (net tons)
Jan. 4	[1] 6,144,000	[1] 3.4	[2] 1,901,000	July 19	8,023,000	6	1,337,000
Jan. 11	11,309,000	6	1,885,000	July 26	8,187,000	6	1,365,000
Jan. 18	10,803,000	6	1,801,000	Aug. 2	8,093,000	6	1,349,000
Jan. 25	11,853,000	6	1,976,000	Aug. 9	7,939,000	6	1,323,000
Feb. 1	11,776,000	6	1,963,000	Aug. 16	8,275,000	6	1,379,000
Feb. 8	11,076,000	6	1,846,000	Aug. 23	8,602,000	6	1,434,000
Feb. 15	10,355,000	6	1,726,000	Aug. 30	9,169,000	6	1,528,000
Feb. 22	9,637,000	5.9	1,633,000	Sept. 6	8,191,000	5.3	1,545,000
Mar. 1	8,283,000	6	1,381,000	Sept. 13	9,262,000	6	1,544,000
Mar. 8	8,674,000	6	1,446,000	Sept. 20	9,034,000	6	1,506,000
Mar. 15	8,180,000	6	1,363,000	Sept. 27	9,219,000	6	1,537,000
Mar. 22	7,932,000	6	1,322,000	Oct. 4	9,423,000	6	1,571,000
Mar. 29	9,025,000	6	1,504,000	Oct. 11	9,616,000	6	1,603,000
Apr. 5	8,353,000	5.8	1,440,000	Oct. 18	9,348,000	6	1,558,000
Apr. 12	8,362,000	6	1,394,000	Oct. 25	10,587,000	6	1,765,000
Apr. 19	8,207,000	6	1,368,000	Nov. 1	10,275,000	6	1,713,000
Apr. 26	8,296,000	6	1,383,000	Nov. 8	9,832,000	5.5	1,788,000
May 3	8,441,000	6	1,407,000	Nov. 15	9,842,000	5.6	1,758,000
May 10	8,391,000	6	1,399,000	Nov. 22	9,004,000	6	1,501,000
May 17	8,273,000	6	1,379,000	Nov. 29	8,816,000	5.2	1,695,000
May 24	8,378,000	6	1,396,000	Dec. 6	9,730,000	6	1,622,000
May 31	7,687,000	5.4	1,424,000	Dec. 13	8,896,000	6	1,483,000
June 7	8,255,000	6	1,376,000	Dec. 20	9,475,000	6	1,579,000
June 14	8,088,000	6	1,348,000	Dec. 27	6,980,000	5	1,396,000
June 21	8,100,000	6	1,350,000	Jan. 3	[1] 5,143,000	[1] 3	[2] 1,591,000
June 28	8,097,000	6	1,350,000				
July 5	6,629,000	5	1,326,000		467,526,000	307.1	1,522,000
July 12	7,961,000	6	1,327,000				

[1] Figures represent the output and number of working days in that part of the week included in the calendar year shown. Figures of total production for these weeks are as follows: Jan. 5, 1929, 10,030,000 net tons; Jan. 4, 1930, 10,267,000 net tons; Jan. 3, 1931, 8,434,000 net tons.

[2] Average daily production for the entire week and not for the working days that fell in the calendar year shown.

TABLE 16.—*Holidays commonly recognized in the bituminous-coal fields and the average fraction of a working day for the country, as a whole, that each holiday represented, 1923–1930*

	Average fraction of full working day							
	1923	1924	1925	1926	1927	1928	1929	1930
January: New Year's Day	0.3	0.2	0.3	0.3	0.3	0.3	0.4	0.4
February: Washington's Birthday	.9	.8	.9	.9	.9	.9	(1)	.9
April: Eight-Hour Day (Apr. 1)	.4	.5	.6	.7	.7	.7	.6	.8
May: Memorial Day	.3	.4	.4	.4	.4	.4	.4	.4
July: Independence Day	--------	--------	--------	--------	--------	--------	--------	--------
September: Labor Day	.3	.3	.4	.4	.4	.4	.3	.3
November:								
General election	--------	.4	--------	.7	--------	.4	.9	.5
Armistice Day	.4	.6	.7	.7	.7	.7	.7	.6
Thanksgiving Day	.1	.2	.3	.5	.1	.2	.2	.2
December: Christmas Day	--------	--------	--------	--------	--------	--------	--------	--------

(1) Full working day.

Table 17.—*Estimated monthly production of bituminous coal and average production per working day, 1927–1930,*[1] *in thousands of net tons*

Month	1927		1928		1929		1930	
	Total	Daily average	Total	Daily average	Total	Daily average	Total	Daily average
January	56, 660	2, 240	44, 925	1, 776	52, 398	1, 985	50, 414	1, 910
February	52, 697	2, 205	42, 022	1, 688	48, 137	2, 006	40, 060	1, 676
March	59, 911	2, 219	44, 668	1, 654	40, 068	1, 541	36, 230	1, 393
April	34, 538	1, 344	32, 710	1, 324	37, 565	1, 467	36, 318	1, 408
May	35, 256	1, 388	37, 218	1, 410	40, 908	1, 550	36, 413	1, 379
June	36, 483	1, 403	36, 546	1, 406	38, 771	1, 551	34, 145	1, 366
July	33, 505	1, 340	36, 864	1, 475	41, 379	1, 592	35, 158	1, 352
August	41, 541	1, 539	41, 774	1, 547	44, 695	1, 655	36, 117	1, 389
September	41, 763	1, 644	41, 971	1, 720	45, 334	1, 866	39, 126	1, 546
October	43, 827	1, 686	51, 176	1, 895	52, 174	1, 932	44, 714	1, 656
November	40, 468	1, 632	46, 788	1, 925	46, 514	1, 876	38, 609	1, 657
December	41, 114	1, 581	44, 083	1, 763	47, 046	1, 882	40, 222	1, 547
	517, 763	1, 684	500, 745	1, 631	534, 989	1, 740	467, 526	1, 522

[1] Monthly statistics from 1905 to 1926 will be found in Coal in 1922, pp. 464–465, and in Coal in 1926, p. 464

The margin of difference between a year of active demand and one of depression in the bituminous-coal industry is illustrated by Figure 41, which shows for certain of the more important producing fields the monthly trend of output in 1930 as compared with that in 1929. It will be noted that although the business depression tended to curtail production everywhere, there were wide variations in the degree to which the individual fields were affected. For the country as a whole the 1930 production fell 12.6 per cent below the level of the previous year, but for the 16 fields shown the decline ranged from 3.8 per cent in Ohio No. 8 to 29.3 per cent in western Kentucky.

The year began with production in most fields not far from the level of the previous year. In fact, in several fields the output in January, 1930, was substantially higher than in the corresponding month of 1929; but as the year progressed and the country slipped deeper into the depression, the margin became progressively wider. By December production for the country as a whole was running 15.6 per cent less than in 1929.

Another interesting feature brought out by Figure 41 is the wide seasonal variation in the different fields. The majority are at a low point in April at the beginning of the coal year and rise to a peak in the fall or early winter; but in some, such as Colorado and southern Illinois, which supply especially large tonnages for domestic heating, the seasonal trend is highly accentuated. On the other hand, the fields producing chiefly industrial coals show much less violent seasonal fluctuations.

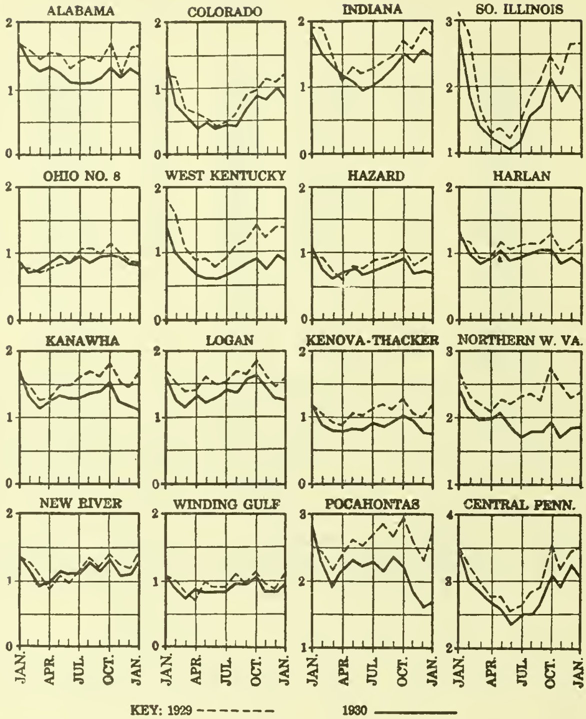

FIGURE 41.—Monthly trend of bituminous-coal production in selected fields, 1929 and 1930. The diagrams have all been plotted on the same scale, except that in certain of the largest districts, such as in southern Illinois, northern West Virginia, and Pocahontas, it was necessary to start at the bottom with 1,000,000 tons instead of with zero, or, even, in central Pennsylvania, to start with 2,000,000 tons. Note also that the diagram for Pocahontas includes the output of Tug River

TABLE 18.—*Estimated monthly production of coal, by States, in 1930, in thousands of net tons*

State	January	February	March	April	May	June	July	August	September	October	November	December	Total
Alabama	1,701	1,422	1,308	1,370	1,285	1,137	1,103	1,131	1,194	1,359	1,223	1,337	15,570
Arkansas	232	148	54	53	50	63	89	111	171	229	155	178	1,533
Colorado	1,285	744	589	388	491	393	447	435	672	883	855	1,015	8,197
Illinois	6,841	4,943	4,285	3,801	3,461	3,141	3,392	3,813	4,137	5,433	4,941	5,543	53,731
Indiana	1,874	1,575	1,375	1,243	1,161	1,029	1,055	1,192	1,322	1,564	1,460	1,640	16,490
Iowa	535	356	315	266	230	224	216	251	308	410	342	440	3,893
Kansas	303	261	163	144	128	117	140	148	207	273	239	307	2,430
Kentucky:													
Eastern	4,271	3,469	2,819	3,286	3,393	3,118	3,173	3,291	3,536	3,778	3,042	3,118	40,294
Western	1,506	1,095	913	742	705	680	724	811	919	977	840	1,003	10,915
Maryland	265	217	182	185	149	169	156	162	173	203	182	228	2,271
Michigan	77	61	66	38	33	40	51	25	53	72	69	76	661
Missouri	461	367	303	285	253	253	284	317	302	362	314	352	3,853
Montana	388	259	214	187	187	184	185	207	263	360	292	296	3,022
New Mexico	256	158	138	148	155	148	133	133	121	204	197	178	1,969
North Dakota	278	162	124	60	53	54	51	61	145	293	230	189	1,700
Ohio	2,078	1,800	1,604	1,667	1,825	1,746	1,844	1,845	1,851	2,194	1,998	2,100	22,552
Oklahoma	486	317	123	137	123	140	157	188	235	356	267	265	2,794
Pennsylvania bituminous	11,759	10,237	10,316	10,458	10,494	9,878	9,991	9,737	10,286	11,564	9,833	9,910	124,463
Tennessee	529	420	420	428	412	386	387	391	412	460	420	465	5,130
Texas	77	95	81	49	49	49	57	65	82	75	62	93	834
Utah	682	372	259	174	175	149	166	232	413	523	529	582	4,256
Virginia	1,156	1,013	921	867	834	792	787	802	916	981	896	942	10,907
Washington	283	184	183	159	160	160	153	157	187	241	210	225	2,302
West Virginia	12,281	9,898	9,010	9,766	10,203	9,732	10,024	10,137	10,638	11,248	9,434	9,102	121,473
Wyoming	795	472	447	399	391	350	381	463	571	657	563	599	6,088
Other States	15	15	18	18	13	13	12	12	12	15	16	39	198
Total bituminous	50,414	40,060	36,230	36,318	36,413	34,145	35,158	36,117	39,126	44,714	38,609	40,222	467,526
Pennsylvania anthracite	6,996	6,120	4,524	4,887	5,911	5,152	5,624	6,153	5,261	7,531	5,176	6,050	69,385
Grand total	57,410	46,180	40,754	41,205	42,324	39,297	40,782	42,270	44,387	52,245	43,785	46,272	536,911

TABLE 19.—*Estimated daily output of coal, by States, in each month of 1930, in thousands of net tons*

State	January	February	March	April	May	June	July	August	September	October	November	December	Total
Alabama	64.4	59.5	50.3	53.1	48.7	45.5	42.4	43.5	47.2	50.3	52.5	51.4	50.7
Arkansas	8.8	6.2	2.1	2.1	1.9	2.5	3.4	4.3	6.8	8.5	6.6	6.8	5.0
Colorado	48.7	31.1	22.7	15.0	18.6	15.7	17.2	16.7	26.6	32.7	36.7	39.0	26.7
Illinois	259.1	206.8	164.8	147.3	131.1	125.6	130.5	146.7	163.5	201.2	212.1	213.2	175.0
Indiana	71.0	65.9	52.9	48.2	44.0	41.2	40.6	45.8	52.2	57.9	62.7	63.1	53.7
Iowa	20.3	14.9	12.1	10.3	8.7	8.9	8.3	9.7	12.2	15.2	14.7	16.9	12.7
Kansas	11.5	10.9	6.3	5.6	4.8	4.7	5.4	5.7	8.2	10.1	10.2	11.8	7.9
Kentucky:													
Eastern	161.8	145.2	108.4	127.4	128.5	124.7	122.0	126.6	139.8	139.9	130.5	119.9	131.2
Western	57.1	45.8	35.1	28.8	26.7	27.2	27.8	31.2	36.3	36.2	36.0	38.6	35.5
Maryland	10.0	9.1	7.0	7.2	5.6	6.8	6.0	6.2	6.8	7.5	7.8	8.8	7.4
Michigan	2.9	2.6	2.5	1.5	1.3	1.6	2.0	1.0	2.1	2.7	3.0	2.9	2.2
Missouri	17.5	15.4	11.7	11.1	9.6	10.1	10.9	12.2	11.9	13.4	13.5	13.5	12.5
Montana	14.7	10.8	8.2	7.2	7.1	7.4	7.1	8.0	10.4	13.3	12.5	11.4	9.9
New Mexico	9.7	6.6	5.3	5.7	5.9	5.9	5.1	5.1	4.8	7.6	8.4	6.8	6.4
North Dakota	10.5	6.8	4.8	2.3	2.0	2.2	2.0	2.3	5.7	10.9	9.9	7.3	5.5
Ohio	78.7	75.3	61.7	64.6	69.1	69.8	70.9	71.0	73.2	81.3	85.7	80.8	73.4
Oklahoma	18.4	13.3	4.7	5.3	4.6	5.6	6.0	7.2	9.3	13.2	11.5	10.2	9.1
Pennsylvania bituminous	445.4	428.3	396.8	405.3	397.5	395.1	384.3	374.5	406.6	428.3	422.0	381.2	405.3
Tennessee	20.0	17.6	16.2	16.6	15.6	15.4	14.9	15.0	16.3	17.0	18.0	17.9	16.7
Texas	2.9	4.0	3.1	1.9	1.9	2.0	2.2	2.5	3.2	2.8	2.7	3.6	2.7
Utah	25.8	15.6	10.0	6.7	6.6	6.0	6.4	8.9	16.3	19.4	22.7	22.4	13.9
Virginia	43.8	42.4	35.4	33.6	31.6	31.7	30.3	30.8	36.2	36.3	38.5	36.2	35.5
Washington	10.7	7.7	7.0	6.2	6.1	6.4	5.9	6.0	7.4	8.9	9.0	8.7	7.5
West Virginia	465.2	414.1	346.5	378.5	386.5	389.3	385.5	389.9	420.5	416.6	404.9	350.1	395.5
Wyoming	30.1	19.7	17.2	15.5	14.8	14.0	14.6	17.8	22.5	24.3	24.2	23.0	19.8
Other States	.6	.6	.7	.7	.5	.5	.5	.5	.5	.6	.7	1.5	.7
Total bituminous	1,909.6	1,676.2	1,393.5	1,407.7	1,379.3	1,365.8	1,352.2	1,389.1	1,546.5	1,656.1	1,657.0	1,547.0	1,522.4
Pennsylvania anthracite	269.1	260.4	174.0	195.5	227.3	206.1	216.3	236.7	210.4	289.7	225.0	232.7	228.6
Grand total	2,178.7	1,936.6	1,567.5	1,603.2	1,606.6	1,571.9	1,568.5	1,625.8	1,756.9	1,945.8	1,882.0	1,779.7	1,751.0

MONTHLY PRODUCTION OF BITUMINOUS COAL, LESS COAL EQUIVALENT OF COKE MADE

If a statistical series presenting bituminous-coal output is desired, which can be used without double counting in conjunction with a series on monthly coke production, it is necessary to deduct the coal equivalent of all coke—beehive and by-product—from the total production of coal.[5] This is done in Table 20 for the period 1923 to 1930.

Examination of the continuous monthly series over a long period may be interesting to students of the business cycle. Data for the period 1912 to 1921 are given in Coal in 1928, page 463, and comparable current figures can be determined easily from the bureau's weekly coal reports.

TABLE 20.—*Monthly production of bituminous coal less coal equivalent of coke made in the same month, 1923–1930, in thousands of net tons* [1]

Month	1923	1924	1925	1926	1927	1928	1929	1930
January	44, 991	46, 165	44, 865	45, 452	50, 059	38, 651	45, 349	43, 880
February	37, 042	41, 038	32, 594	38, 826	46, 549	35, 978	41, 533	33, 869
March	40, 830	34, 465	30, 845	38, 396	52, 901	38, 034	32, 557	29, 461
April	36, 473	24, 328	27, 471	32, 925	27, 952	26, 392	30, 390	29, 743
May	39, 840	26, 967	29, 494	31, 900	28, 794	30, 647	33, 218	29, 862
June	39, 591	27, 033	31, 481	35, 094	30, 377	30, 294	31, 296	28, 055
July	39, 342	29, 170	33, 969	36, 376	27, 492	30, 734	33, 759	29, 396
August	43, 394	31, 656	39, 130	39, 331	35, 464	35, 495	37, 096	30, 616
September	41, 038	37, 825	40, 791	41, 965	35, 843	35, 707	38, 158	33, 966
October	44, 255	43, 174	46, 410	47, 227	37, 801	44, 361	44, 767	39, 499
November	38, 308	36, 824	43, 444	52, 424	34, 822	40, 106	39, 616	33, 839
December	35, 101	40, 066	45, 027	50, 580	35, 261	37, 162	40, 464	35, 535
	480, 205	418, 711	445, 521	490, 496	443, 315	423, 561	448, 203	397, 721

[1] The figures represent all bituminous coal produced other than that made into coke and therefore include coal-mine fuel, local sales for all purposes other than coke making, and shipments for all purposes other than coke making.

They are obtained by subtracting from the figures of total production for the month the coal equivalent of the beehive and by-product coke made in the same month. This coal equivalent can be computed with great accuracy from the known production of coke. There is, however, a time discrepancy of unknown and varying amount between the coal production series and the coke production series, which arises from the fact that coal charged into by-product ovens must ordinarily be shipped some distance from the mine and that the by-product plants maintain stocks of coal to even up irregularities in their receipts, which stocks fluctuate between 11 and 42 days' supply. The error introduced by this time discrepancy is seldom serious, however, the less so because in the case of beehive coke the production of raw coal and its conversion into coke are one continuous process.

NUMBER AND SIZE OF MINES

The fundamental unit in the statistical record of the bureau is the mine, and operating companies are asked to make a separate report for each mine. For most purposes the mine is a better unit than the company. The mine's location is definitely known and can be related to a specific field or county. Its identity can be followed through successive changes of ownership; and it is the natural operating unit from the point of view of cost, mechanical equipment, mining practice, accident hazards, and output per man per day. The number of mines is naturally much greater than the number of operating companies.

Tables 21 to 23 show the number of active mines, not including those idle or abandoned. Table 21 emphasizes the large number in operation during periods of high prices. The peak was reached in 1920, when spot prices averaged $5.64 a ton and sales realizations on all coal, including contract deliveries, $3.75 a ton. In that year the bureau received reports from 14,766 mines of all kinds in operation, including several thousand wagon mines. The number of commercial mines in that year was 8,921.

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[5] Tryon, F. G., Monthly Production of Anthracite Coal and Shipments and Production of Beehive Coke: Rev. Econ. Statistics, October, 1926, pp. 199–204.

As already explained, no attempt has been made to collect data on the wagon mines during the years of depression, and since 1923 the record covers commercial mines only. It is well known, however, that thousands of wagon mines which sprang up mushroomlike in the period of high prices have since disappeared.

Table 22 covers the commercial mines only and classifies them by size. Class 1A includes mines producing over 500,000 tons; class 1B those producing less than 500,000 but more than 200,000 tons; class 2 those producing 200,000 to 100,000 tons; and so on down to class 5, which includes mines producing less than 10,000 tons. It is important to note that the classification is based not on capacity, but on the year's production; hence, a mine in class 2 this year may drop to class 3 the next, and in years of dull market and short working time the number in the smaller-size groups is increased by this fact.

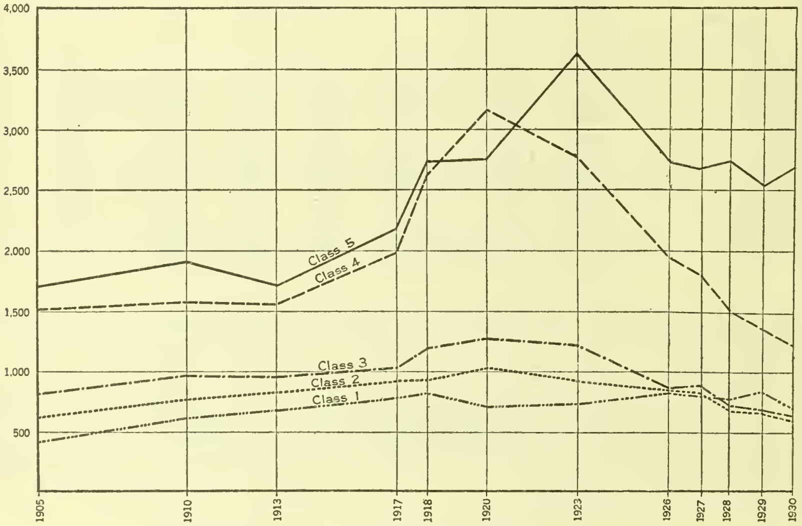

FIGURE 42.—Number of commercial bituminous-coal mines in each size class, 1905–1930

With these qualifications understood Table 22 brings out clearly the long-time changes, and the same data are shown graphically in Figure 42. The number of operating mines of all sizes increased fairly steadily up to the period of the war, climbed rapidly to a peak in 1920–1923, and has since declined. The reduction has come chiefly in the intermediate size classes. There has been an actual increase in the number of large mines and with it gradual concentration of more and more of the output in the larger units. In 1905, 40.2 per cent of the bituminous production came from class-1 mines. By 1923 the proportion had increased to 47.2 per cent and by 1930 had risen to 63.1.

Table 23 shows in detail the number of mines in each size class and in each State for 1930.

TABLE 21.—*Number of mines operating and price of bituminous coal f. o. b. mines, 1913, 1917–1930*

Year	Number of commercial bituminous mines in operation	Total number of bituminous mines in operation, including wagon mines	Average spot price f. o. b. mines (Coal Age)	Average sales realization per ton on all coal f. o. b. mines
1913	5,776	(1)	$1.23	$1.18
1917	6,939	10,634	3.25	2.26
1918	8,319	11,038	[2] 2.58	2.58
1919	8,994	12,409	2.59	2.49
1920	8,921	14,766	5.64	3.75
1921	8,038	(1)	2.55	2.89
1922	9,299	14,150	3.64	3.02
1923	9,331	11,715	2.77	2.68
1924	7,586	(1)	$2.08	$2.20
1925	7,144	(1)	2.06	2.04
1926	7,177	(1)	2.21	2.06
1927	7,011	(1)	1.99	1.99
1928	6,450	(1)	1.80	1.86
1929	6,057	(1)	1.79	1.78
1930	5,891	(1)	1.75	1.70

[1] Not available.

[2] Price fixed by fuel administrator.

TABLE 22.—*Number and yearly output of commercial bituminous-coal mines, by size classes, 1905, 1910, 1913, 1918–1930* [1]

[Exclusive of wagon mines producing less than 1,000 tons]

Year	Class 1A (more than 500,000 tons)	Class 1B (200,000 to 500,000 tons)	Class 2 (100,000 to 200,000 tons)	Class 3 (50,000 to 100,000 tons)	Class 4 (10,000 to 50,000 tons)	Class 5 (less than 10,000 tons)	Total
Number of mines:							
1905	411		612	808	1,514	1,715	5,060
1910	618		763	960	1,568	1,909	5,818
1913	694		837	959	1,558	1,728	5,776
1918	821		929	1,198	2,636	2,735	8,319
1919	550		854	1,181	2,784	3,625	8,994
1920	701		1,031	1,279	3,160	2,750	8,921
1921	482		807	1,003	2,346	3,400	8,038
1922	416		848	1,084	3,139	3,812	9,299
1923	748		935	1,176	2,742	3,730	9,331
1924	129	517	819	943	2,047	3,131	7,586
1925	145	569	833	891	1,969	2,737	7,144
1926	174	649	845	867	1,912	2,730	7,177
1927	132	647	818	879	1,831	2,704	7,011
1928	152	621	687	725	1,513	2,752	6,450
1929	209	618	660	668	1,361	2,541	6,057
1930	173	543	608	641	1,239	2,684	5,891
Net tons produced (thousands):							
1905	126,499		85,920	57,386	38,995	6,034	314,834
1910	191,519		107,052	68,858	42,282	6,561	416,272
1913	241,463		118,476	69,018	42,292	6,280	477,529
1918	281,267		131,027	87,143	67,453	11,387	578,277
1919	174,848		120,926	84,625	71,334	13,198	464,931
1920	237,468		142,750	90,669	82,129	10,716	563,732
1921	162,438		115,607	71,160	56,099	10,618	415,922
1922	131,876		117,195	77,287	77,203	15,248	418,809
1923	265,869		130,804	84,342	68,769	13,639	563,423
1924	88,568	148,770	115,217	67,967	52,606	10,559	483,687
1925	108,577	170,613	117,986	64,578	48,900	9,399	520,053
1926	135,544	197,503	120,598	62,650	47,616	9,456	573,367
1927	93,631	190,023	115,506	63,712	45,987	8,904	517,763
1928	116,709	187,539	96,950	52,197	38,694	8,656	500,745
1929	158,454	190,571	95,783	48,400	33,827	7,954	534,989
1930	129,479	165,735	87,068	46,143	31,176	7,925	467,526
Per cent of total number of mines:							
1905	8.1		12.1	16.0	29.9	33.9	100.0
1910	10.6		13.1	16.5	27.0	32.8	100.0
1913	12.0		14.5	16.6	27.0	29.9	100.0
1918	9.8		11.2	14.4	31.7	32.9	100.0
1919	6.1		9.5	13.1	31.0	40.3	100.0
1920	7.9		11.6	14.3	35.4	30.8	100.0
1921	6.0		10.0	12.5	29.2	42.3	100.0
1922	4.5		9.1	11.7	33.7	41.0	100.0
1923	8.0		10.0	12.6	29.4	40.0	100.0
1924	1.7	6.8	10.8	12.4	27.0	41.3	100.0
1925	2.0	8.0	11.6	12.5	27.6	38.3	100.0
1926	2.4	9.1	11.8	12.1	26.6	38.0	100.0
1927	1.9	9.2	11.7	12.5	26.1	38.6	100.0
1928	2.4	9.6	10.6	11.2	23.5	42.7	100.0
1929	3.4	10.2	10.9	11.0	22.5	42.0	100.0
1930	3.0	9.2	10.3	10.9	21.0	45.6	100.0
Per cent of total tonnage:							
1905	40.2		27.3	18.2	12.4	1.9	100.0
1910	46.0		25.7	16.5	10.2	1.6	100.0
1913	50.6		24.8	14.4	8.9	1.3	100.0
1918	48.6		22.7	15.1	11.6	2.0	100.0
1919	37.6		26.0	18.2	15.4	2.8	100.0
1920	42.1		25.3	16.1	14.6	1.9	100.0
1921	39.1		27.8	17.1	13.5	2.5	100.0
1922	31.5		28.0	18.5	18.4	3.6	100.0
1923	47.2		23.2	15.0	12.2	2.4	100.0
1924	18.3	30.7	23.8	14.1	10.9	2.2	100.0
1925	20.9	32.8	22.7	12.4	9.4	1.8	100.0
1926	23.6	34.5	21.0	10.9	8.3	1.7	100.0
1927	18.1	36.7	22.3	12.3	8.9	1.7	100.0
1928	23.3	37.4	19.4	10.4	7.7	1.8	100.0
1929	29.6	35.6	17.9	9.1	6.3	1.5	100.0
1930	27.7	35.4	18.6	9.9	6.7	1.7	100.0

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[1] This table shows mines, not companies, and should not be confused with other tables that include country banks and many wagon mines shipping by rail.

TABLE 23.—*Number and production of commercial bituminous-coal mines, by size classes, in each State, in 1930*

[No canvass of wagon mines producing less than 1,000 tons was made]

State	Class 1A (more than 500,000 tons)					Class 1B (200,000 to 500,000 tons)					Class 2 (100,000 to 200,000 tons)					Class 3 (50,000 to 100,000 tons)				
	Mines		Production			Mines		Production			Mines		Production			Mines		Production		
	Number	Per cent	Total (net tons)	Average per mine (net tons)	Per cent	Number	Per cent	Total (net tons)	Average per mine (net tons)	Per cent	Number	Per cent	Total (net tons)	Average per mine (net tons)	Per cent	Number	Per cent	Total (net tons)	Average per mine (net tons)	Per cent
Alabama	5	2.6	3, 241, 471	648, 294	20.8	16	8.2	4, 941, 564	308, 848	31.8	24	12.2	3, 266, 162	136, 090	21.0	43	21.9	3, 193, 496	74, 267	20.5
Arizona																				
Arkansas											1	1.3	103, 848	103, 848	6.8	6	7.8	403, 967	67, 328	26.4
Colorado						8	3.7	2, 360, 453	295, 057	28.8	21	9.6	3, 044, 342	144, 969	37.2	20	9.2	1, 386, 146	69, 307	16.9
Georgia																				
Illinois	35	6.9	28, 642, 085	818, 345	53.3	48	9.4	16, 235, 719	338, 244	30.2	31	6.1	4, 323, 533	139, 469	8.0	26	5.1	1, 801, 758	69, 298	3.4
Indiana	4	2.4	2, 598, 898	649, 725	15.8	29	17.4	9, 270, 648	319, 678	56.2	17	10.2	2, 333, 750	137, 279	14.2	17	10.2	1, 195, 709	70, 336	7.3
Iowa						4	1.7	959, 373	239, 843	24.6	8	3.4	1, 129, 400	141, 175	29.1	10	4.3	665, 027	66, 503	17.1
Kansas						1	.6	216, 664	216, 664	8.9	6	3.3	879, 968	146, 661	36.2	6	3.3	447, 678	74, 613	18.4
Kentucky:																				
Eastern	6	1.8	4, 848, 218	808, 036	12.0	65	19.3	19, 439, 739	299, 073	48.3	61	18.2	8, 606, 046	141, 083	21.4	69	20.5	4, 825, 210	69, 931	12.0
Western	1	.7	596, 824	596, 824	5.5	16	11.9	4, 391, 146	274, 447	40.1	23	17.2	3, 283, 944	142, 780	30.1	20	14.9	1, 491, 877	74, 594	13.7
Maryland											6	7.3	898, 604	149, 767	39.6	9	11.0	675, 433	75, 048	29.7
Missouri						4	1.9	1, 013, 923	253, 481	26.3	7	3.2	938, 983	134, 140	24.4	7	3.2	467, 089	66, 727	12.1
Montana	1	1.2	1, 065, 366	1,065,366	35.3	3	3.5	958, 561	319, 520	31.7	4	4.7	541, 198	135, 300	17.9	2	2.3	159, 811	79, 906	5.3
New Mexico						1	2.3	404, 790	404, 790	20.6	5	11.4	727, 827	145, 565	37.0	12	27.3	746, 852	62, 238	37.8
North Carolina																				
North Dakota						3	1.9	834, 949	278, 316	49.1	2	1.3	321, 043	160, 522	18.9	1	.6	63, 977	63, 977	3.8
Ohio	10	1.7	5, 920, 809	592, 081	26.3	26	4.5	7, 407, 485	284, 903	32.8	27	4.7	3, 663, 073	135, 669	16.2	33	5.7	2, 340, 254	70, 917	10.4
Oklahoma						1	.9	244, 292	244, 292	8.7	3	2.7	484, 534	161, 511	17.3	12	10.8	770, 682	64, 224	27.6
Pennsylvania	56	4.2	46, 637, 817	832, 818	37.4	110	8.2	34, 842, 353	316, 749	28.0	149	11.2	21, 662, 996	145, 389	17.4	148	11.1	10, 783, 332	72, 860	8.7
South Dakota																				
Tennessee						6	7.6	1, 560, 062	260, 010	30.4	12	15.2	1, 653, 968	137, 831	32.2	16	20.3	1, 164, 642	72, 790	22.7
Texas											3	12.0	386, 362	128, 787	46.3	2	8.0	122, 135	61, 068	14.7
Utah						10	25.6	2, 964, 841	296, 484	69.6	4	10.3	457, 307	114, 327	10.7	9	23.1	627, 895	69, 766	14.8
Virginia	6	6.9	3, 764, 573	627, 429	34.5	12	13.8	3, 338, 531	278, 211	30.6	15	17.2	2, 009, 807	133, 987	18.4	16	18.4	1, 098, 618	68, 664	10.1
Washington						5	10.9	1, 389, 801	277, 960	60.3	2	4.3	369, 967	184, 984	16.1	3	6.5	220, 378	73, 459	9.6
West Virginia	48	5.6	31, 653, 808	659, 454	26.1	164	19.2	49, 865, 921	304, 060	41.0	164	19.2	23, 901, 863	145, 743	19.7	146	17.1	10, 613, 054	72, 692	8.7
Wyoming	1	1.7	508, 988	508, 988	8.4	10	16.7	2, 855, 417	285, 542	46.9	11	18.3	1, 764, 680	160, 425	29.0	9	15.0	730, 194	81, 133	12.0
Other States [1]						1	5.3	238, 754	238, 754	29.9	2	10.5	314, 630	157, 315	39.3	2	10.5	147, 798	73, 899	18.5
	173	3.0	129, 478, 857	748, 433	27.7	543	9.2	165, 734, 986	305, 221	35.4	608	10.3	87, 067, 835	143, 204	18.6	644	10.9	46, 143, 012	71, 651	9.9

[1] Includes Alaska, California, Idaho, Michigan, and Oregon.

TABLE 23.—*Number and production of commercial bituminous-coal mines, by size classes, in each State, in 1930*—Continued

State	Class 4 (10,000 to 50,000 tons)					Class 5 (less than 10,000 tons)					Total		
	Mines		Production			Mines		Production			Mines	Production (net tons)	
	Number	Per cent	Total (net tons)	Average per mine (net tons)	Per cent	Number	Per cent	Total (net tons)	Average per mine (net tons)	Per cent		Total	Average per mine
Alabama	26	13. 3	766, 915	29, 497	4. 9	82	41. 8	160, 450	1, 957	1. 0	196	15, 570, 058	79, 439
Arizona						4	100. 0	9, 084	2, 271	100. 0	4	9, 084	2, 271
Arkansas	34	44. 2	883, 676	25, 990	57. 5	36	46. 7	141, 943	3, 943	9. 3	77	1, 533, 434	19, 915
Colorado	40	18. 3	1, 108, 407	27, 710	13. 5	129	59. 2	297, 562	2, 307	3. 6	218	8, 196, 910	37, 601
Georgia						1	100. 0	7, 092	7, 092	100. 0	1	7, 092	7, 092
Illinois	70	13. 8	1, 864, 780	26, 640	3. 5	298	58. 7	863, 355	2, 897	1. 6	508	53, 731, 230	105, 770
Indiana	32	19. 2	795, 252	24, 852	4. 8	68	40. 6	295, 705	4, 349	1. 8	167	16, 489, 962	98, 742
Iowa	34	14. 6	733, 540	21, 575	18. 8	177	76. 0	405, 231	2, 289	10. 4	233	3, 892, 571	16, 706
Kansas	25	13. 8	528, 107	21, 124	21. 8	143	79. 0	357, 512	2, 500	14. 7	181	2, 429, 929	13, 425
Kentucky:													
Eastern	84	25. 0	2, 394, 904	28, 511	5. 9	51	15. 2	179, 577	3, 521	. 4	336	40, 293, 694	119, 922
Western	44	32. 9	1, 043, 210	23, 709	9. 6	30	22. 4	108, 300	3, 610	1. 0	134	10, 915, 301	81, 457
Maryland	24	29. 3	592, 863	24, 703	26. 1	43	52. 4	103, 693	2, 411	4. 6	82	2, 270, 593	27, 690
Missouri	41	19. 0	1, 062, 104	25, 905	27. 6	157	72. 7	371, 051	2, 363	9. 6	216	3, 853, 150	17, 839
Montana	10	11. 6	190, 895	19, 090	6. 3	66	76. 7	106, 173	1, 609	3. 5	86	3, 022, 004	35, 140
New Mexico	2	4. 5	23, 619	11, 810	1. 2	24	54. 5	66, 345	2, 764	3. 4	44	1, 969, 433	44, 760
North Carolina	1	100. 0	28, 500	28, 500	100. 0						1	28, 500	28, 500
North Dakota	12	7. 7	200, 726	16, 727	11. 8	138	88. 5	279, 462	2, 025	16. 4	156	1, 700, 157	10, 898
Ohio	96	16. 6	2, 229, 846	23, 228	9. 9	385	66. 8	990, 511	2, 573	4. 4	577	22, 551, 978	39, 085
Oklahoma	48	43. 3	1, 127, 556	23, 491	40. 4	47	42. 3	166, 890	3, 551	6. 0	111	2, 793, 954	25, 171
Pennsylvania	356	26. 6	8, 468, 594	23, 788	6. 8	517	38. 7	2, 067, 695	3, 999	1. 7	1, 336	124, 462, 787	93, 161
South Dakota						17	100. 0	12, 810	754	100. 0	17	12, 810	754
Tennessee	24	30. 3	666, 721	27, 780	13. 0	21	26. 6	85, 035	4, 049	1. 7	79	5, 130, 428	64, 942
Texas	15	60. 0	298, 565	19, 904	35. 8	5	20. 0	26, 810	5, 362	3. 2	25	833, 872	33, 355
Utah	6	15. 4	181, 280	30, 213	4. 3	10	25. 6	26, 218	2, 622	. 6	39	4, 257, 541	109, 168
Virginia	21	24. 2	645, 190	30, 723	5. 9	17	19. 5	50, 658	2, 980	. 5	87	10, 907, 377	125, 372
Washington	10	21. 7	208, 554	20, 855	9. 1	26	56. 6	113, 228	4, 355	4. 9	46	2, 301, 928	50, 042
West Virginia	174	20. 3	4, 866, 948	27, 971	4. 0	159	18. 6	571, 044	3, 591	. 5	855	121, 472, 638	142, 073
Wyoming	6	10. 0	179, 225	29, 871	2. 9	23	38. 3	49, 629	2, 158	. 8	60	6, 088, 133	101, 469
Other States [1]	4	21. 1	86, 440	21, 610	10. 8	10	52. 6	12, 129	1, 213	1. 5	19	799, 751	42, 092
	1, 239	21. 0	31, 176, 417	25, 183	6. 7	2, 684	45. 6	7, 925, 192	2, 952	1. 7	5, 891	467, 526, 299	79, 363

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[1] Includes Alaska, California, Idaho, Michigan, and Oregon.

NUMBER AND SIZE OF COMPANIES, AS DISTINCT FROM MINES

The foregoing statistics represent the number of mines or openings. The number of producing companies is of course much less, because some of the largest companies operate dozens of mines. No count was made of the number of companies in 1930, but Tables 24 and 25, analyzing the returns for 1929, illustrate conditions in the bituminous-coal industry in recent years.

In preparing the tables, every corporation (or partnership or individual operator) reporting to the bureau has been counted as one producer or "company" and no account has been taken of interlocking ownership or interests. Numerous instances of financially affiliated corporations will occur to anyone familiar with the industry. Sometimes the relation is that of direct ownership of one company by another, in which case the parent company dictates the policy of the subsidiary. More often it is a community of interest sufficient to influence policy but not to control it. The Bureau of Mines has never sought to inquire into such relationships, and in default of accurate information it has seemed best to treat each corporation as a separate business unit. If it were possible to allow for such cases of common ownership, the total number of producing interests would be somewhat less than the tables show, and the number in the larger groups would be greater. Essentially, however, the picture would remain the same—a very large number of producing units struggling for the available business.

Reduction in number of operating companies.—The number of commercial operators in 1929 (not counting wagon mines producing less than 1,000 tons) was found to be 4,612. (See Table 24.) Of these there were 2,277 producing less than 10,000 tons a year; at the other extreme were 17 companies, operating 221 mines, that produced over 3,000,000 tons each. In the size classes above 200,000 tons a year, there were in all 553 companies, and they produced 79.7 per cent of the total output. The remaining 20.3 per cent was contributed by the 4,059 smaller companies producing less than 200,000 tons a year.

Comparison of these figures with 1920 shows the drastic liquidation of productive capacity that has been brought about by the years of depression in the coal industry. Since 1920, a total of 1,665 operators have been forced out of the bituminous-coal industry. The mortality has been greatest among the companies producing between 10,000 and 200,000 tons a year. Above 200,000 tons, on the other hand, the mortality has been small; in fact, in the groups over 500,000 tons there has been an actual increase. The changes are fully discussed in Coal in 1929, pages 716–719.

TABLE 24.—*Trend of size of bituminous-coal operating companies, 1895–1929*

[Data exclude wagon mines producing less than 1,000 tons a year. Each operating company is treated as one operator, regardless of possible affiliations with other concerns]

Companies producing—	Number of operators				Per cent of total production			
	1895	1905	1920	1929	1895	1905	1920	1929
Less than 10,000 tons	1,055	1,492	2,349	[1] 2,277	2.1	1.6	1.6	1.3
10,000 to 50,000	590	961	2,121	1,043	11.6	7.8	9.4	4.8
50,000 to 100,000	285	403	727	408	15.4	8.9	9.1	5.5
100,000 to 200,000	268	331	543	331	41.7	14.6	13.4	8.7
200,000 to 500,000		199	348	335		18.8	18.7	19.9
500,000 to 1,000,000	32	49	109	131	29.2	10.8	13.3	17.0
1,000,000 to 3,000,000		39	64	70		19.8	19.5	22.9
3,000,000 and over		10	16	17		17.7	15.0	19.9
	2,230	3,484	6,277	4,612	100.0	100.0	100.0	100.0

[1] Figures for 1929 are not entirely comparable with those for 1920. (See Coal in 1929, p. 716.)

"Captive" and "independent" companies.—About one-fourth of the production of bituminous coal comes from mines owned or controlled by consumers of coal, which are known in the trade as "captive" mines.[6] In Table 25 the captive companies are shown separately, because their sales connections differ sharply from those of the ordinary independent producer. Many captive companies are operated solely to supply the needs of the consumer owner and sell no coal on the commercial market. Such, for example, is the policy of the mines controlled by the railroads and the larger steel companies. Their operations have little effect upon the commercial market. Other consumer-controlled companies, especially those affiliated with the public utilities, the lesser steel companies, and the manufacturing industries, sell their surplus on the commercial market, using the requirements of the consumer owner as a backlog of steady business and thereby improving their operating time and lowering their per-ton costs.

Where the commercial sales of a consumer-affiliated company form a large part of its total output it is not easy to decide whether to classify the company as "captive" or "independent." In some previous compilations (see Coal in 1926, pp. 466–475) the classification of captive or independent was applied to individual mines, and where the consumer owner utilized the product of certain of the mines only, the other mines of the company were classified as independent. In making the compilation by companies, shown in Table 25, it was necessary to classify the company as a whole either one way or the other; hence, where more than half of the company's tonnage was captive the entire company was classed as captive, and where less than half was captive it was classed as independent. It results unavoidably that some of the tonnage of the "captive" group in Table 25 is sold on the commercial market and vice versa.

In 1929, 226 companies were classified as captive, with a production of 123,473,000 tons, and 4,386 companies classified as independent, with a production of 411,515,000 tons. The captive companies thus furnished 23.1 per cent of the national output and the independent companies 76.9 per cent. This figure indicates approximately the aggregate tonnage sold competitively on the commercial market.

Corresponding figures for each of the 19 major bituminous fields of the country will be found in Coal in 1929, pages 721 to 733.

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[6] For detailed statistics of captive mines see Tryon, F. G., Kiessling, O. E., and Mann, L., Coal: **Bureau** of Mines, Mineral Resources of the United States, 1926, Pt. II, pp. 466–475.

TABLE 25.—*Bituminous coal-mining operations in the United States in 1929, classified by size of producing company* [1]

Companies producing—	Number of companies	Number of mines	Actual production		Average sales realization	Average tons per man per day	Average day worked	Potential production if mines worked 280 days	Excess of potential over actual production
			Net tons	Per cent					
INDEPENDENT									
Under 10,000 tons	2,241	2,298	6,730,206	1.3	$2.22	2.74	127	14,953,000	8,223,000
10,000 to 50,000 tons	990	1,104	24,808,138	4.6	1.92	3.42	163	43,360,000	18,552,000
50,000 to 100,000 tons	389	471	27,873,603	5.2	1.84	3.91	194	40,809,000	12,935,000
100,000 to 200,000 tons	302	426	42,399,342	7.9	1.73	4.54	216	55,564,000	13,165,000
200,000 to 500,000 tons	304	528	95,215,469	17.8	1.71	5.02	229	117,604,000	22,388,000
500,000 to 1,000,000 tons	104	291	71,747,400	13.4	1.66	5.32	230	88,877,000	17,130,000
1,000,000 tons and over	56	452	142,741,110	26.7	1.67	5.16	235	173,262,000	30,521,000
Total	4,386	5,570	411,515,268	76.9	1.72	4.77	214	534,429,000	122,914,000
CONSUMER OWNED [2]									
Under 10,000 tons	36	39	184,278	------	2.02	3.03	192	263,000	79,000
10,000 to 50,000 tons	53	62	1,242,602	.2	2.03	3.74	185	1,969,000	726,000
50,000 to 100,000 tons	19	29	1,414,067	.3	2.08	3.53	187	2,157,000	743,000
100,000 to 200,000 tons	29	47	4,138,055	.8	2.09	3.85	216	5,554,000	1,416,000
200,000 to 500,000 tons	31	63	11,218,750	2.1	2.15	4.30	250	12,610,000	1,391,000
500,000 to 1,000,000 tons	27	62	19,053,324	3.6	1.95	5.45	232	23,744,000	4,691,000
1,000,000 to 3,000,000 tons	24	110	41,312,883	7.7	1.91	5.14	234	49,315,000	8,002,000
3,000,000 tons and over	7	75	44,909,366	8.4	2.02	5.58	259	48,784,000	3,875,000
Total	226	487	123,473,325	23.1	1.99	5.13	240	144,396,000	20,923,000
Grand total	4,612	6,057	534,988,593	100.0	1.78	4.85	219	678,825,000	143,837,000

[1] Excludes wagon mines producing less than 1,000 tons a year. Each operating corporation (or partnership or individual) is treated as 1 operator, regardless of possible affiliations with other corporations.

[2] Includes companies owned by consumers where half or more of annual output is taken by the consumer owner; if less than half is so taken the company is classified as commercial.

VALUE AND PRICES

DEFINITION OF VALUES REPORTED

The value given in this report is the amount received at the mines f. o. b. cars minus the selling expense, and the average value per ton is the average amount received, obtained by dividing the total value by the number of tons sold or produced. Coal used at the mines, coal coked by the producing company, and coal used in some other industry by that company—in all, forming a considerable part of the total output—is not sold, and the value placed upon it is either an estimate or the amount at which it is carried on the company's books. Either value is presumably the amount the coal would have brought if it had been sold or the amount other fuel for the purpose stated would have cost if it had been purchased. In other words, the values given represent returns to the operators for coal sold plus the estimated value of that not sold. The value thus fixed is more or less arbitrary and does not necessarily represent the current prices for coal sold commercially. Many mines are owned by consumers who take all or a great part of their output at nominal prices. The output of such "captive" mines was 22.7 per cent of the entire production in 1926. (Coal in 1926, pp. 473–475.) In 1929, for example, the average value reported by "captive" companies was $1.99 a ton, or considerably more than that reported by the commercial companies, which was $1.72. (See Table 25.) Even where the coal is actually sold large quantities may be moved on "cost plus" contracts that provide for prices below the average spot prices in the field or the average prices received for coal delivered under ordinary contracts. The figures in the following tables, therefore, do not necessarily show prices on the commercial market or even an average of the prices at the mines. Taken over a period of years, however, they do furnish a faithful index to the rise and fall in the value of coal.

The computed "average value per ton" is thus affected by the value placed by the operator upon coal used at the mine but not shipped. In order to ascertain how large an influence the inclusion of this noncommercial coal might have upon the average, the operators were requested for several years to give separate statements of value for coal loaded at the mines for shipment, for sales to local trade, and for mine fuel and coal made into beehive coke. It was found, however, that for practical purposes the average value of all the coal produced may be accepted as a measure of the average value of the coal shipped. The values placed by operators on mine fuel and upon the coal coked were generally somewhat less than the average amounts received for the coal shipped, but the quantities to which these lower values applied were so much smaller than the quantity shipped that their effect upon the average for all coal was negligible. (Coal in 1922, p. 546.)

ESTIMATES OF VALUE INCLUDED IN STATISTICS

If an operator who is known to have produced coal during the year makes no report of the value of his product to the Bureau of Mines, an estimate of the value is included in the total to make it complete These estimates are based on the average for each county as obtained from all reports of the operators in the county that did specify value.

Of the $795,483,000 given as the total value of the bituminous coal at the mines in 1930, fully $759,686,000 represents actual reports from the operators and $35,797,000 represents estimates made in the manner just described. The proportion actually reported is thus 95.5 per cent of the total, a proportion so high as to indicate that the results are thoroughly representative for the country as a whole. The percentage actually reported in each of the principal States is shown in Table 26.

TABLE 26.—*Per cent of total value of bituminous coal produced by commercial operators that is represented by actual reports from the operators, by States, in 1930*

State	Per cent	State	Per cent
Alabama	81.8	North Dakota	99.8
Arkansas	66.8	Ohio	96.7
Colorado	98.0	Oklahoma	63.3
Illinois	93.9	Pennsylvania	97.6
Indiana	96.5	Tennessee	99.5
Iowa	76.5	Texas	97.0
Kansas	87.1	Utah	98.8
Kentucky	92.9	Virginia	98.1
Maryland	96.7	Washington	98.4
Michigan	100.0	West Virginia	98.5
Missouri	99.7	Wyoming	99.9
Montana	99.4		
New Mexico	99.6	United States	95.5

TABLE 27.—*Total and average value per net ton of coal at mines, by States, 1923 and 1930*

State	Total			Average per net ton		
	1923	1930	Increase or decrease	1923	1930	Increase or decrease
Alabama	$51,624,000	$31,616,000	−$20,008,000	$2.52	$2.03	−$0.49
Alaska	755,000	631,000	−124,000	6.30	5.25	−1.05
Arizona		29,000			3.19	
Arkansas	5,192,000	5,153,000	−39,000	4.01	3.36	−.65
California, Idaho, and Oregon	79,000	100,000	+21,000	3.94	5.39	+1.55
Colorado	33,299,000	21,485,000	−11,814,000	3.22	2.62	−.60
Georgia	327,000	18,000	−309,000	4.32	2.54	−1.78
Illinois	198,388,000	93,484,000	−104,904,000	2.50	1.74	−.76
Indiana	65,046,000	26,178,000	−38,868,000	2.48	1.59	−.89
Iowa	20,517,000	10,385,000	−10,132,000	3.59	2.67	−.92
Kansas	14,275,000	5,231,000	−9,044,000	3.21	2.15	−1.06
Kentucky	113,542,000	76,186,000	−37,356,000	2.54	1.49	−1.05
Maryland	6,911,000	3,690,000	−3,221,000	3.02	1.63	−1.39
Michigan	5,545,000	2,323,000	−3,222,000	4.73	3.51	−1.22
Missouri	11,575,000	8,967,000	−2,608,000	3.40	2.33	−1.07
Montana	9,652,000	6,043,000	−3,609,000	3.07	2.00	−1.07
New Mexico	10,668,000	6,017,000	−4,651,000	3.66	3.06	−.60
North Carolina	132,000	100,000	−32,000	3.66	3.51	−.15
North Dakota	3,275,000	2,768,000	−507,000	2.36	1.63	−.73
Ohio	98,610,000	31,643,000	−66,967,000	2.43	1.40	−1.03
Oklahoma	10,874,000	7,768,000	−3,106,000	3.77	2.78	−.99
Pennsylvania bituminous	472,217,000	213,584,000	−258,633,000	2.75	1.72	−1.03
South Dakota	25,000	31,000	+6,000	2.41	2.42	+.01
Tennessee	16,515,000	8,417,000	−8,098,000	2.73	1.64	−1.09
Texas	2,162,000	1,307,000	−855,000	1.82	1.57	−.25
Utah	13,657,000	10,515,000	−3,142,000	2.89	2.47	−.42
Virginia	32,468,000	17,520,000	−14,948,000	2.76	1.61	−1.15
Washington	10,894,000	7,439,000	−3,455,000	3.72	3.23	−.49
West Virginia	285,481,000	181,722,000	−103,759,000	2.65	1.50	−1.15
Wyoming	20,916,000	15,133,000	−5,783,000	2.76	2.49	−.27
Total bituminous	1,514,621,000	795,483,000	−719,138,000	2.68	1.70	−.98
Pennsylvania anthracite	506,787,000	354,574,000	−152,213,000	5.43	5.11	−.32
Grand total	2,021,408,000	1,150,057,000	−871,351,000	3.07	2.14	−.93

AVERAGE VALUE PER TON

Changes in the average value of coal per net ton from 1880 to 1930 are shown in Table 28. It is noteworthy that the downward trend in sales realizations on bituminous coal, apparent since 1923, continued in 1930. In the latter year the average value per ton was $1.70, the lowest realization since 1916. The decline in the grand average reflected reductions in comparison with the preceding year in all but four States. (See Table 29.)

TABLE 28.—*Average value per net ton of coal at mines, 1880–1930*

Year	Anthracite [1]	Bituminous	Year	Anthracite [1]	Bituminous	Year	Anthracite [1]	Bituminous
1880	$1.47	$1.25	1897	$1.51	$0.81	1914	$2.07	$1.17
1881	2.01	1.12	1898	1.41	.80	1915	2.07	1.13
1882	2.01	1.12	1899	1.46	.87	1916	2.30	1.32
1883	2.01	1.07	1900	1.49	1.04	1917	2.85	2.26
1884	1.79	.94	1901	1.67	1.05	1918	3.40	2.58
1885	2.00	1.13	1902	1.84	1.12	1919	4.14	2.49
1886	1.95	1.05	1903	2.04	1.24	1920	4.85	3.75
1887	2.01	1.11	1904	1.90	1.10	1921	5.00	2.89
1888	1.91	1.00	1905	1.83	1.06	1922	5.01	3.02
1889	1.44	.99	1906	1.85	1.11	1923	5.43	2.68
1890	1.43	.99	1907	1.91	1.14	1924	5.43	2.20
1891	1.46	.99	1908	1.90	1.12	1925	5.30	2.04
1892	1.57	.99	1909	1.84	1.07	1926	5.62	2.06
1893	1.59	.96	1910	1.90	1.12	1927	5.26	1.99
1894	1.51	.91	1911	1.94	1.11	1928	5.22	1.86
1895	1.41	.86	1912	2.11	1.15	1929	5.22	1.78
1896	1.50	.83	1913	2.13	1.18	1930	5.11	1.70

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[1] Averages for anthracite represent amounts per net ton and include all coal produced.

TABLE 29.—*Average value per net ton of coal at mines, by States, 1913, 1917, 1920, 1923, and 1925–1930*

State	1913	1917	1920	1923	1925	1926	1927	1928	1929	1930	
										Average	Increase or decrease from 1929
Alabama	$1.31	$2.27	$3.65	$2.52	$2.12	$2.29	$2.25	$2.25	$2.08	$2.03	−$0.05
Alaska	(1)	4.92	5.83	6.30	4.89	5.26	5.25	5.25	5.25	5.25	------
Arkansas	1.76	2.56	4.56	4.01	3.96	3.77	3.48	3.38	3.32	3.36	+.04
California [1]	3.45	2.30	4.36	3.94	4.75	3.67	2.81	3.13	3.96	4.67	+.71
Colorado	1.52	2.22	3.49	3.22	2.94	2.78	2.78	2.80	2.65	2.62	−.03
Georgia	1.41	2.53	5.00	4.32	3.32	2.89	3.04	3.10	3.05	2.54	−.51
Illinois	1.14	1.88	3.08	2.50	2.19	2.14	2.16	2.00	1.87	1.74	−.13
Indiana	1.11	1.99	3.16	2.48	2.02	1.98	2.03	1.78	1.63	1.59	−.04
Iowa	1.79	2.35	3.94	3.59	3.14	3.07	3.15	2.86	2.82	2.67	−.15
Kansas	1.67	2.31	3.87	3.21	2.88	2.84	2.80	2.44	2.25	2.15	−.10
Kentucky	1.05	2.17	4.11	2.54	1.72	1.74	1.73	1.56	1.54	1.49	−.05
Maryland	1.24	2.46	4.63	3.02	1.97	2.21	2.07	1.84	1.75	1.63	−.12
Michigan	1.99	3.22	4.93	4.73	4.20	4.12	4.31	4.26	3.61	3.51	−.10
Missouri	1.73	2.43	4.16	3.40	3.07	2.98	2.84	2.58	2.43	2.33	−.10
Montana	1.74	2.11	3.16	3.07	2.59	2.46	2.35	2.27	2.22	2.00	−.22
New Mexico	1.46	1.86	3.68	3.66	3.37	3.16	3.13	3.18	3.17	3.06	−.11
North Carolina	------	------	7.02	3.66	4.34	4.19	3.58	3.30	3.39	3.51	+.12
North Dakota	1.52	1.80	2.87	2.36	1.85	1.74	1.70	1.68	1.70	1.63	−.07
Ohio	1.10	2.48	3.82	2.43	1.93	1.96	1.92	1.69	1.51	1.40	−.11
Oklahoma	2.05	2.81	4.80	3.77	3.30	3.18	3.03	2.96	3.04	2.78	−.26
Oregon	2.53	3.38	4.49	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Pennsylvania bituminous	1.11	2.44	3.77	2.75	2.10	2.13	2.05	1.90	1.80	1.72	−.08
South Dakota	1.96	2.90	3.60	2.41	2.91	2.91	3.04	2.80	2.96	2.42	−.54
Tennessee	1.14	2.19	4.02	2.73	1.85	1.90	1.84	1.73	1.69	1.64	−.05
Texas	1.77	1.77	3.75	1.82	1.55	1.60	1.51	1.34	1.45	1.57	+.12
Utah	1.65	2.07	3.22	2.89	2.56	2.37	2.32	2.53	2.47	2.47	------
Virginia	1.01	2.00	3.99	2.76	1.84	1.92	1.80	1.71	1.64	1.61	−.03
Washington	2.38	2.68	3.88	3.72	3.62	3.61	3.50	3.46	3.43	3.23	−.20
West Virginia	1.01	2.32	4.34	2.65	1.71	1.84	1.72	1.59	1.55	1.50	−.05
Wyoming	1.56	1.93	2.98	2.76	2.79	2.74	2.69	2.64	2.54	2.49	−.05
Total bituminous	1.18	2.26	3.75	2.68	2.04	2.06	1.99	1.86	1.78	1.70	−.08
Pennsylvania anthracite [2]	2.13	2.85	4.85	5.43	5.30	5.62	5.26	5.22	5.22	5.11	−.11

[1] California includes Alaska, 1913; Arizona, 1926–1930; Idaho, 1913–1930; Nevada, 1927 and 1929; and Oregon, 1923–1930.

[2] These values represent amounts per net ton and include all coal produced.

AVERAGE EXPORT PRICES

TABLE 30.—*Average value per net ton of bituminous coal exported from the United States to Canada and to all other destinations, by months, 1925–1930*

[Computed from records of Bureau of Foreign and Domestic Commerce. Figures represent value at port, including transportation, and are therefore affected by changes in freight rates as well as f. o. b. mine prices. They include, of course, both spot and contract shipments. Data for 1902 to 1923 were published in Coal in 1923, pp. 624–625]

Month	1925		1926		1927		1928		1929		1930	
	Canada	All other	Canada	All other	Canada	All other	Canada	All other	Canada	All other	Canada	All other
January	$4.31	$4.13	$3.72	$4.42	$4.37	$5.34	$3.84	$4.45	$3.85	$4.33	$3.92	$4.16
February	4.42	4.25	3.84	4.28	4.17	4.52	3.87	4.21	3.75	4.35	3.84	4.22
March	3.98	4.18	3.75	4.16	4.17	4.45	3.81	4.35	3.84	4.30	3.96	4.04
April	3.98	4.11	4.00	4.26	3.89	4.37	3.96	4.37	4.00	4.15	3.70	4.11
May	3.72	4.06	3.74	4.25	3.63	4.36	3.63	4.33	3.79	4.23	3.66	4.09
June	3.85	4.10	3.73	4.28	3.61	4.26	3.56	4.14	3.51	4.05	3.51	4.02
July	3.77	4.06	3.81	4.35	3.62	4.21	3.52	4.15	3.62	3.77	3.59	3.93
August	3.84	4.08	3.85	4.37	3.59	4.22	3.45	4.11	3.75	4.10	3.55	3.90
September	3.61	4.28	3.70	4.49	3.70	4.27	3.47	4.12	3.56	4.04	3.46	3.93
October	3.72	4.23	3.76	4.71	3.62	4.29	3.42	4.31	3.67	4.20	3.66	4.00
November	3.79	4.25	3.90	5.47	3.69	4.34	3.48	4.21	3.67	4.06	3.64	3.89
December	3.77	4.38	4.10	5.51	4.01	4.29	3.81	4.06	3.84	4.16	4.34	3.98
Average	3.84	4.16	3.83	4.79	3.81	4.60	3.59	4.23	3.70	4.14	3.67	4.05

SPOT PRICES

The figures of average value collected by the Bureau of Mines are a composite of business covered by contract or trade connections of long standing at stable prices and business on the open market, termed by the trade "spot sales." The spot price reflects the momentary condition of the market as interpreted by the buyer seeking low prices on the one hand and by the seller attempting to place his coal at the maximum profit on the other. Much significance, therefore, attaches to the course of spot prices as an index to the state of trade. (See Table 32 and Figure 35.) As indicated in Table 31, however, the spot price should not be taken as a measure of sales realization by the coal producer over any extended period.

TABLE 31.—*Average spot price and average amount received per ton for bituminous coal, 1906–1930*

Year	Coal Age's average spot price	Average amount received	Difference [1]	Year	Coal Age's average spot price	Average amount received	Difference [1]
1906	$1.21	$1.11	+$0.10	1920	$5.64	$3.75	+$1.89
1907	1.18	1.14	+.04	1921	2.55	2.89	−.34
1908	1.05	1.12	−.07	1922	3.64	3.02	+.62
1909	1.04	1.07	−.03	1923	2.77	2.68	+.09
1910	1.23	1.12	+.11	1924	2.08	2.20	−.12
1911	1.07	1.11	−.04	1925	2.06	2.04	+.02
1912	1.21	1.15	+.06	1926	2.21	2.06	+.15
1913	1.23	1.18	+.05	1927	1.99	1.99	--------
1914	1.14	1.17	−.03	1928	1.80	1.86	−.06
1915	1.12	1.13	−.01	1929	1.79	1.78	+.01
1916	1.85	1.32	+.53	1930	1.75	1.70	+.05
1917	3.25	2.26	+.99				
1918	2.58	2.58	--------	Average 25 years	2.00	1.84	+.16
1919	2.59	2.49	+.10				

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[1] A plus sign indicates that the spot price was greater than the average amount received, and a minus sign indicates that it was less than the average amount received.

TABLE 32.—*Monthly average spot price of bituminous coal f. o. b. mines, 1911–1930, as published by Coal Age*

[Figures are average of trade-journal quotations on 14 coals representative of nearly 90 per cent of the bituminous output of the United States, weighted, first, with respect to the proportions each of slack, prepared, and run-of-mine normally shipped, and, second, with respect to the tonnage of each normally produced. For 1919 to 1930 the figures are those published currently by Coal Age, based upon the reports of its field correspondents. For 1913 to 1918 they are taken from Prices of Coal and Coke, by C. E. Lesher, published in 1919 as a chapter of Mineral Resources of the United States, 1918, and also separately by the Fuel Administration and the War Industries Board, modified slightly, however, to permit comparison with the postwar quotations. For 1911 and 1912 they are taken from a study by F. G. Tryon and W. F. McKenney, compiled in as nearly the same way as the trade-journal quotations available permit and representing 12 or 14 coals covered by the later series. Data for 1906 to 1910 will be found in Coal in 1923, p. 621]

Month	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January	$1.16	$1.14	$1.46	$1.21	$1.13	$1.53	$4.15	$2.48	$2.57	$2.57
February	1.11	1.22	1.22	1.16	1.12	1.40	4.18	2.53	2.49	2.58
March	1.08	1.64	1.17	1.17	1.09	1.27	3.89	2.58	2.47	2.58
April	1.06	1.30	1.17	1.16	1.08	1.24	3.21	2.64	2.43	3.85
May	1.05	1.11	1.15	1.16	1.07	1.21	4.14	2.67	2.38	4.59
June	1.05	1.09	1.14	1.12	1.07	1.26	4.00	2.57	2.40	7.18
July	1.03	1.04	1.18	1.12	1.05	1.22	3.17	2.58	2.47	8.24
August	1.02	1.05	1.22	1.13	1.07	1.30	3.24	2.58	2.76	9.51
September	1.03	1.09	1.23	1.11	1.10	1.57	2.02	2.58	2.91	8.52
October	1.04	1.21	1.29	1.13	1.12	2.26	2.02	2.58	3.09	7.78
November	1.09	1.30	1.31	1.10	1.17	3.87	2.48	2.58	2.57	5.87
December	1.09	1.29	1.26	1.11	1.33	4.01	2.48	2.58	2.58	4.38
Average	1.07	1.21	1.23	1.14	1.12	1.85	3.25	2.58	2.59	5.64

TABLE 32.—*Monthly average spot price of bituminous coal f. o. b. mines, 1911–1930, as published by Coal Age*—Continued

Month	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
January	$3.26	$2.25	$4.38	$2.21	$2.10	$2.18	$2.34	$1.85	$1.85	$1.88
February	2.77	2.20	3.59	2.25	2.04	2.09	2.11	1.86	1.86	1.81
March	2.63	2.12	3.20	2.15	1.99	2.01	2.06	1.91	1.78	1.75
April	2.62	2.24	2.84	2.07	1.95	1.92	1.93	1.74	1.69	1.71
May	2.68	3.11	2.68	2.04	1.97	1.93	1.87	1.73	1.68	1.68
June	2.52	3.31	2.56	2.03	1.95	1.90	1.85	1.73	1.67	1.68
July	2.40	4.67	2.40	1.98	1.93	1.91	1.87	1.71	1.70	1.70
August	2.42	6.13	2.39	1.99	2.04	2.00	2.06	1.74	1.77	1.68
September	2.37	5.08	2.46	2.02	2.18	2.15	2.07	1.81	1.83	1.75
October	2.33	4.48	2.28	2.10	2.13	2.70	1.96	1.83	1.90	1.80
November	2.35	4.11	2.25	2.06	2.26	3.19	1.90	1.85	1.88	1.78
December	2.26	4.05	2.18	2.06	2.19	2.53	1.90	1.85	1.87	1.78
Average	2.55	3.64	2.77	2.08	2.06	2.21	1.99	1.80	1.79	1.75

AVERAGE COST OF RAILROAD FUEL

TABLE 33.—*Average cost per net ton of coal used by Class I railroads in road-train and yard-switching service, by months, 1927–1930* [1]

Month	1927		1928		1929		1930	
	Including direct freight charges	Excluding direct freight charges	Including direct freight charges	Excluding direct freight charges	Including direct freight charges	Excluding direct freight charges	Including direct freight charges	Excluding direct freight charges
January	$2.72	$2.30	$2.57	$2.17	$2.42	$2.03	$2.35	$1.97
February	2.70	2.27	2.56	2.15	2.42	2.02	2.35	1.94
March	2.66	2.24	2.56	2.14	2.42	2.02	2.35	1.94
April	2.67	2.23	2.57	2.14	2.43	2.02	2.34	1.94
May	2.63	2.20	2.57	2.13	2.41	2.02	2.34	1.96
June	2.63	2.20	2.55	2.14	2.41	2.03	2.35	1.97
July	2.65	2.18	2.54	2.14	2.40	2.02	2.35	1.98
August	2.67	2.16	2.53	2.14	2.41	2.02	2.34	1.98
September	2.70	2.18	2.52	2.13	2.39	2.02	2.34	1.98
October	2.69	2.18	2.49	2.10	2.38	2.01	2.32	1.95
November	2.60	2.20	2.44	2.05	2.37	1.98	2.30	1.93
December	2.60	2.20	2.43	2.04	2.37	1.98	2.30	1.91
Average	2.66	2.21	2.53	2.12	2.40	2.01	2.34	1.95

[1] As reported currently to the Interstate Commerce Commission.

AVERAGE RETAIL PRICES

TABLE 34.—*Average retail price per net ton of bituminous coal in 38 cities, as compiled by the Bureau of Labor Statistics, by months, 1925–1930*

Month	1925		1926		1927		1928		1929		1930	
	Average price	Relative price 1913=100.0	Average price	Relative price 1913=100.0	Average price	Relative price 1913=100.0	Average price	Relative price 1913=100.0	Average price	Relative price 1913=100.0	Average price	Relative price 1913=100.0
January	$9.24	170.0	$9.74	179.3	$9.96	183.3	$9.30	171.1	$9.09	167.2	$9.11	167.6
February	9.36	172.2	9.72	178.8	9.86	181.4	9.28	170.8	9.07	166.9	9.04	166.4
March	9.16	168.6	9.25	170.2	9.74	179.3	9.26	170.4	9.06	166.7	9.02	166.0
April	8.75	161.0	9.11	167.6	8.95	164.7	8.94	164.6	8.76	161.3	8.84	162.7
May	8.63	158.8	8.76	161.2	8.88	163.4	8.69	159.9	8.52	156.8	8.53	157.0
June	8.61	158.4	8.67	159.5	8.89	163.6	8.72	160.4	8.50	156.5	8.54	157.2
July	8.61	158.5	8.70	160.1	8.91	163.9	8.69	159.9	8.62	158.6	8.65	159.1
August	8.69	159.8	8.81	162.1	8.99	165.4	8.74	160.9	8.69	159.9	8.70	160.1
September	9.11	167.7	9.25	170.3	9.20	169.3	8.84	162.6	8.87	163.2	8.79	161.7
October	9.24	169.9	9.59	176.5	9.33	171.7	8.96	164.8	8.98	165.3	8.88	163.3
November	9.71	178.6	10.24	188.4	9.32	171.5	9.07	166.9	9.00	165.6	8.94	164.6
December	9.74	179.2	10.15	186.8	9.31	171.3	9.11	167.6	9.05	166.5	8.94	164.4
Average	9.07	166.9	9.33	171.7	9.28	170.7	8.97	165.0	8.85	162.9	8.83	162.5

LABOR STATISTICS

MEN EMPLOYED

The method of collecting employment statistics is explained in detail in Coal in 1929, pages 738 to 740. These statistics are believed to represent the most accurate returns obtainable under present conditions, both as to the records generally available in mine offices and as to the funds allotted to the Bureau of Mines for collecting data.

As previously noted, 493,202 men were employed at bituminous-coal mines in 1930, a decrease of 9,791 workers from the preceding year. The number of employees reached a maximum in 1923, when 704,793 men were reported. In comparison with the latter figure, the labor force in 1930 represents a decrease of 30 per cent. The extent to which the recent reductions affected mine workers in most of the important coal-producing States is indicated in Table 35.

TABLE 35.—*Comparative number of employees in coal mines, by States, 1923, 1927, 1929, and 1930*

State	Average number employed				Per cent of increase or decrease		
	1923	1927	1929	1930	1923–1930	1927–1930	1929–30
Alabama	30,035	27,615	25,208	24,393	−18.8	−11.7	−3.2
Arkansas	3,754	3,706	4,299	4,626	+23.2	+24.8	+7.6
Colorado	13,340	11,999	12,057	11,091	−16.9	−7.6	−8.0
Illinois	99,714	76,970	56,725	53,603	−46.2	−30.4	−5.5
Indiana	35,408	24,352	15,250	13,881	−60.8	−43.0	−9.0
Iowa	11,448	8,741	7,295	7,901	−31.0	−9.6	+8.3
Kansas	9,761	7,004	5,139	4,855	−50.3	−30.7	−5.5
Kentucky	60,811	64,747	58,649	56,674	−6.8	−12.5	−3.4
Maryland	3,725	3,459	3,289	3,299	−11.4	−4.6	+.3
Michigan	1,977	1,512	1,336	1,294	−34.5	−14.4	−3.1
Missouri	6,952	6,232	5,618	5,700	−18.0	−8.5	+1.5
Montana	3,511	2,281	2,283	2,085	−40.6	−8.6	−8.7
New Mexico	4,095	3,456	3,233	2,902	−29.1	−16.0	−10.2
North Dakota	1,621	1,341	1,421	1,258	−22.4	−6.2	−11.5
Ohio	54,555	35,543	25,399	25,574	−53.1	−28.0	+.7
Oklahoma	7,130	5,796	6,321	5,424	−23.9	−6.4	−14.2
Pennsylvania bituminous	194,981	153,699	131,774	130,150	−33.2	−15.3	−1.2
Tennessee	11,244	7,691	7,619	7,535	−33.0	−2.0	−1.1
Texas	2,452	1,674	1,313	1,305	−46.8	−22.0	−.6
Utah	4,381	3,339	3,458	3,504	−20.0	+4.9	+1.3
Virginia	14,120	13,211	12,053	11,709	−17.1	−11.4	−2.9
Washington	4,306	3,407	2,946	2,801	−35.0	−17.8	−4.9
West Virginia	117,300	119,799	104,942	105,988	−9.6	−11.5	+1.0
Wyoming	7,529	5,791	4,839	5,216	−30.7	−9.9	+7.8
Other States [1]	643	553	527	434	−32.5	−21.5	−17.6
Total bituminous	704,793	593,918	502,993	493,202	−30.0	−17.0	−1.9
Pennsylvania anthracite	157,743	165,259	151,501	150,804	−4.4	−8.7	−.5
Grand total	862,536	759,177	654,494	644,006	−25.3	−15.2	−1.6

[1] Includes Alaska, Arizona (1927, 1929, and 1930), California, Georgia, Idaho, Nevada (1929), North Carolina, Oregon, and South Dakota.

CLASSIFICATION OF MINE EMPLOYEES

The employees engaged in coal mining fall into two groups. One group includes those who are directly engaged in winning the coal and who are paid by the piece at so much a ton. They are known collectively as "tonnage men," or often as "contract men," because each pieceworker in a sense is a contractor, obligating himself to get out coal and maintain his working place at a fixed rate of compensation. The tonnage men work underground.

The men in the other group are known collectively as "daymen," or sometimes as "company men." They are paid by the day. Their duties are concerned with the maintenance of the mine, with construction and repair work, with the operation of haulage and ventilation systems and the pumps, hoists, and power house, and with the work at the tipple, where the coal is dumped from mine car to railroad car and often cleaned, picked, or sized. The daymen are classified as "inside" and "outside" men, according as they work underground or on the surface.

In the anthracite region the terms "company men" and "contract men" are commonly applied to the two groups, and in the bituminous fields, although usage varies widely, the terms "tonnage men" and "daymen" are perhaps most frequently used.

There are exceptions to the statement that the men engaged directly in winning the coal are pieceworkers and that all others are paid according to time, for piece rates are sometimes applied to other tasks, and again men may be placed on the day roll while engaged in mining a bit of difficult coal where their tonnage rate would not yield a living wage. Broadly, however, the distinction holds.

To get approximate figures of the number of tonnage men, the operators since 1920 have been asked to report the number of "miners, hand or machine, loaders, and shot firers." (See Table 36.) This grouping would include pick miners, loaders after machines, and operators of the cutting machines themselves, also the small group of shot firers who are commonly paid by the piece and who perform, in the districts where they are employed, a task that elsewhere is a part of the work of the miner himself. The classification "all other workers underground," in this table, including the haulage and track employees, is practically equivalent to the inside daymen. The outside men are, with rare exceptions, all time-workers, although some are paid by the month rather than the day.

Of the total labor force employed in 1930, 63.6 per cent was engaged directly in the business of winning the coal, 22.9 per cent served this first group underground in some way or other, and 13.5 per cent worked on the surface. During the past decade the proportion of workers underground has been gradually increasing, while a corresponding decline is noted in the proportion of surface workers. (See Table 36.) There is, however, wide variation in the ratios of underground and surface men in the different States and under different mining conditions, as is readily seen from Table 37.

TABLE 36.—*Men employed underground and on the surface in coal mines, 1921–1930*

[Corresponding data for the years 1911 to 1920 will be found in Coal in 1924, p. 481]

Year	Underground						Surface		Total number
	Miners, loaders, and shot firers		All others [1]		Total underground		Number	Per cent	
	Number	Per cent	Number	Per cent	Number	Per cent			
Anthracite:									
1921	73,977	46.4	42,840	26.8	116,817	73.2	42,682	26.8	159,499
1922	72,527	46.2	41,752	26.6	114,279	72.8	42,570	27.2	156,849
1923	72,362	45.9	42,359	26.8	114,721	72.7	43,022	27.3	157,743
1924	76,035	47.5	43,328	27.1	119,363	74.6	40,646	25.4	160,009
1925	78,773	49.1	41,795	26.1	120,568	75.2	39,744	24.8	160,312
1926	81,963	49.5	44,268	26.8	126,231	76.3	39,155	23.7	165,386
1927	82,583	50.0	44,614	27.0	127,197	77.0	38,062	23.0	165,259
1928	81,627	50.8	42,269	26.3	123,896	77.1	36,785	22.9	160,681
1929	77,395	51.1	40,461	26.7	117,856	77.8	33,645	22.2	151,501
1930	78,770	52.2	39,980	26.5	118,750	78.7	32,054	21.3	150,804
Bituminous:									
1921	399,270	60.1	168,019	25.4	567,289	85.5	96,465	14.5	663,754
1922	407,772	59.3	174,637	25.3	582,409	84.6	105,549	15.4	687,958
1923	422,040	59.9	178,265	25.3	600,305	85.2	104,488	14.8	704,793
1924	380,324	61.4	151,580	24.4	531,904	85.8	87,700	14.2	619,604
1925	367,456	62.5	139,085	23.6	506,541	86.1	81,952	13.9	588,493
1926	370,292	62.3	140,532	23.7	510,824	86.0	82,823	14.0	593,647
1927	372,565	62.7	139,541	23.5	512,106	86.2	81,812	13.8	593,918
1928	329,364	63.1	121,596	23.3	450,960	86.4	71,190	13.6	522,150
1929	315,678	62.8	118,321	23.5	433,999	86.3	68,994	13.7	502,993
1930	313,617	63.6	113,125	22.9	426,742	86.5	66,460	13.5	493,202

[1] Indicates haulage and track.

TABLE 37.—*Men employed in coal mines, by States, in 1930*

State	Underground						Surface		Total number
	Miners, loaders, and shot firers		Haulage and track		All others		Number	Per cent	
	Number	Per cent	Number	Per cent	Number	Per cent			
Alabama	15,173	62.2	2,700	11.1	3,004	12.3	3,516	14.4	24,393
Alaska	40	40.4	7	7.1	20	20.2	32	32.3	99
Arizona	18	75.0	3	12.5	2	8.3	1	4.2	24
Arkansas	3,185	68.9	469	10.1	387	8.4	585	12.6	4,626
California, Idaho, and Oregon	57	41.3	7	5.1	9	6.5	65	47.1	138
Colorado	7,411	66.8	1,134	10.2	958	8.7	1,588	14.3	11,091
Georgia	43	71.6	7	11.7	4	6.7	6	10.0	60
Illinois	33,893	63.2	5,844	10.9	6,713	12.5	7,153	13.4	53,603
Indiana	8,050	58.0	1,485	10.7	1,327	9.6	3,019	21.7	13,881
Iowa	5,883	74.5	675	8.5	713	9.0	630	8.0	7,901
Kansas	3,160	65.1	367	7.5	212	4.4	1,116	23.0	4,855
Kentucky	35,007	61.8	7,084	12.5	7,101	12.5	7,482	13.2	56,674
Maryland	2,293	69.5	356	10.8	293	8.9	357	10.8	3,299
Michigan	884	68.3	182	14.1	122	9.4	106	8.2	1,294
Missouri	3,560	62.5	441	7.7	395	6.9	1,304	22.9	5,700
Montana	1,185	56.8	248	11.9	155	7.4	497	23.9	2,085
New Mexico	1,956	67.4	290	10.0	226	7.8	430	14.8	2,902
North Carolina	45	64.3	5	7.1	5	7.1	15	21.5	70
North Dakota	638	50.7	74	5.9	50	4.0	496	39.4	1,258
Ohio	17,858	69.8	2,359	9.2	2,378	9.3	2,979	11.7	25,574
Oklahoma	3,445	63.5	639	11.8	460	8.5	880	16.2	5,424
Pennsylvania bituminous	89,452	68.7	12,690	9.8	13,506	10.4	14,502	11.1	130,150
South Dakota	23	53.5	4	9.3	4	9.3	12	27.9	43
Tennessee	5,015	66.6	824	10.9	757	10.0	939	12.5	7,535
Texas	877	67.2	141	10.8	120	9.2	167	12.8	1,305
Utah	1,925	54.9	489	14.0	428	12.2	662	18.9	3,504
Virginia	6,422	54.8	1,691	14.4	1,857	15.9	1,739	14.9	11,709
Washington	1,681	60.0	289	10.3	410	14.7	421	15.0	2,801
West Virginia	61,431	58.0	16,089	15.2	13,607	12.8	14,861	14.0	105,988
Wyoming	3,007	57.6	750	14.4	559	10.7	900	17.3	5,216
Total bituminous	313,617	63.6	57,343	11.6	55,782	11.3	66,460	13.5	493,202
Pennsylvania anthracite	78,770	52.2	13,736	9.1	26,244	17.4	32,054	21.3	150,804
Grand total	392,387	60.9	71,079	11.0	82,026	12.8	98,514	15.3	644,006

DAYS WORKED BY MINES

To both operators and miners alike operating time is a factor of great importance. It is important to the producer because a considerable part of his overhead expenses continues when the mine is idle, while it is important to the miner because his earning capacity hinges upon the number of days he is afforded work. The number of potential working days in a year averages somewhat more than 300; but there are few bituminous mines in the country that approach this maximum, and at most mines the operating time is much less. In 1929, for example, the average time worked was 219 days; and this was considered a particularly good record, as it was the largest for any year since 1920. With the demand for coal sharply curtailed in 1930, a corresponding reduction is shown in the operating time, the average for the country as a whole being only 187 days.

Table 38 indicates that the decline in the number of days worked was almost country wide. In only four States did the average operating time amount to 200 days or more for the year, while in six States the number of days worked averaged less than 150.

TABLE 38.—*Average number of days worked by coal mines, by States, 1921–1930*

State	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Alabama	166	215	232	220	246	266	231	222	231	189
Alaska	244	147	220	287	243	221	229	224	174	294
Arizona	------	------	------	------	------	90	156	208	137	196
Arkansas	112	81	97	134	112	135	137	146	146	115
California [1]	149	250	206	156	174	103	208	177	113	74
Colorado	164	191	174	178	192	202	196	193	187	169
Georgia	183	242	231	248	220	253	250	280	260	71
Illinois	152	120	158	148	161	172	114	156	177	156
Indiana	128	110	136	136	159	173	120	150	172	157
Iowa	148	131	181	161	153	183	114	175	195	155
Kansas	137	125	139	151	169	158	138	128	160	126
Kentucky	152	140	152	174	206	230	237	212	222	187
Maryland	120	101	178	173	209	235	220	233	246	197
Michigan	196	162	222	178	186	171	188	187	217	187
Missouri	166	113	155	135	166	174	151	180	185	166
Montana	143	140	179	173	171	162	197	191	189	172
New Mexico	150	216	216	204	202	251	251	213	214	176
North Carolina	300	167	275	287	272	292	284	180	260	290
North Dakota	194	175	182	165	153	162	168	177	192	180
Ohio	134	100	150	143	151	159	98	171	201	189
Oklahoma	141	114	133	124	153	183	197	169	178	148
Pennsylvania bituminous	151	154	213	180	200	224	203	218	230	198
South Dakota	129	138	122	138	143	127	125	128	127	109
Tennessee	154	163	183	159	211	234	235	226	228	196
Texas	139	185	178	166	150	195	202	203	212	181
Utah	151	204	160	182	179	186	209	191	211	168
Virginia	166	198	212	226	254	263	238	226	249	200
Washington	159	194	213	202	193	198	210	220	227	205
West Virginia	149	143	169	182	225	247	235	223	247	204
Wyoming	167	128	192	176	178	181	189	214	230	188
Total bituminous	149	142	179	171	195	215	191	203	219	187
Pennsylvania anthracite	271	151	268	274	182	244	225	217	225	208
Grand total	173	144	195	192	192	221	199	206	221	192

[1] California includes Idaho, 1921-1930; Oregon, 1921-1930; Nebraska in 1924; and Nevada in 1927 and 1929.

LENGTH OF WORKING DAY

ESTABLISHED WORKING DAY

The established working day in the coal mines of the United States is now generally eight hours. When market and other conditions permit the mines work six days a week, and the established working week is 48 hours. Since 1918 more than 90 per cent of the men have been employed in mines with an 8-hour working day. In 1920 the percentage in 8-hour mines reached 97.1; since then it has declined to 92.4 per cent in 1930. (See Table 40.) As indicated in Table 39, the proportion of 9 and 10 hour mines in 1930 was greater in the fields east of the Mississippi and south of the Ohio and Potomac Rivers.

TABLE 39.—*Number of bituminous-coal mines in the United States having established working day of certain length and number of men employed in 1930*

State	8 hours [1]		9 hours		10 hours		All others [2]		Total	
	Mines	Men	Mines	Men	Mines	Men	Mines	Men	Mines	Men
Alabama	39	2,729	63	15,287	24	3,015	70	3,362	196	24,393
Alaska	------	------	------	------	------	------	5	99	5	99
Arkansas	71	4,557	------	------	1	50	5	19	77	4,626
Arizona, California, Idaho, and Oregon	8	149	------	------	------	------	4	13	12	162
Colorado	125	10,702	------	------	------	------	93	389	218	11,091
Georgia	1	60	------	------	------	------	------	------	1	60
Illinois	303	51,887	4	28	------	------	201	1,688	508	53,603
Indiana	131	13,589	1	8	------	------	35	284	167	13,881
Iowa	126	7,417	------	------	------	------	107	484	233	7,901
Kansas	93	3,955	4	37	------	------	84	863	181	4,855
Kentucky	415	50,222	26	5,444	7	317	22	691	470	56,674
Maryland	60	2,959	------	------	------	------	22	340	82	3,299
Michigan	6	1,294	------	------	------	------	------	------	6	1,294
Missouri	122	4,920	3	79	1	16	90	685	216	5,700
Montana	27	1,755	------	------	2	135	57	195	86	2,085
New Mexico	34	2,866	------	------	------	------	10	36	44	2,902
North Carolina	------	------	------	------	1	70	------	------	1	70
North Dakota	28	589	1	11	4	211	123	447	156	1,258
Ohio	323	24,404	5	100	2	5	247	1,065	577	25,574
Oklahoma	91	5,018	6	296	------	------	14	110	111	5,424
Pennsylvania	1,145	125,841	43	2,534	2	115	146	1,660	1,336	130,150
South Dakota	------	------	------	------	------	------	17	43	17	43
Tennessee	67	5,833	6	1,269	------	------	6	433	79	7,535
Texas	13	583	9	463	1	193	2	66	25	1,305
Utah	36	3,492	------	------	------	------	3	12	39	3,504
Virginia	78	10,945	1	165	------	------	8	599	87	11,709
Washington	41	2,786	------	------	------	------	5	15	46	2,801
West Virginia	741	98,745	38	5,901	8	569	68	773	855	105,988
Wyoming	53	5,195	------	------	------	------	7	21	60	5,216
	4,177	442,492	210	31,622	53	4,696	1,451	14,392	5,891	493,202

[1] Includes outside employees working 9 or 10 hours a day at many mines where the established time for underground workers is 8 hours.

[2] Includes employees in mines where the established working day was changed during year, where the working day was irregular, or which failed to answer the inquiry.

TABLE 40.—*Per cent of men employed in bituminous-coal mines that had established working days of 8, 9, and 10 hours, 1905–1930* [1]

Year	Per cent of total employees in—			Weighted average working day (hours)	Year	Per cent of total employees in—			Weighted average working day (hours)
	8-hour mines	9-hour mines	10-hour mines			8-hour mines	9-hour mines	10-hour mines	
1905	61.1	13.6	25.3	8.6	1919	95.5	3.5	1.0	8.06
1906	63.0	13.5	23.5	8.6	1920	97.1	2.0	.9	8.04
1907	64.0	11.6	24.4	8.6	1921	96.6	2.9	.5	8.04
1908	63.5	11.1	25.4	8.6	1922	95.1	4.0	.9	8.06
1910	62.1	11.3	26.6	8.6	1923	94.7	4.2	1.1	8.06
1911	62.9	10.9	26.2	8.6	1924	93.7	5.1	1.2	8.08
1912	61.6	11.5	26.9	8.6	1925	93.5	5.4	1.1	8.08
1913	61.9	15.2	22.9	8.6	1926	93.7	5.5	.8	8.07
1914	60.7	15.4	23.9	8.6	1927	93.4	5.6	1.0	8.08
1915	59.6	17.0	23.4	8.6	1928	93.1	6.1	.8	8.08
1916	58.6	17.4	24.0	8.6	1929	92.5	6.7	.8	8.08
1917	79.0	12.6	8.4	8.3	1930	92.4	6.6	1.0	8.09
1918	90.6	6.7	2.7	8.12					

[1] Calculated on basis of total number of men in mines definitely reported as having 8, 9, or 10 hour day. A small number of mines that work more than 10 hours or less than 8 hours have been excluded, as have also all mines for which the reports were defective or which changed their working day during the year.

AVERAGE TIME SPENT UNDERGROUND

In discussing the length of the working day in the coal mines it is necessary to distinguish between the established working day and the time actually spent at work. The established working day does not of itself measure the length of time the men actually work, because the mine may shut down before the full day is out, because the miner may go home before the mine stops, and because he spends a certain amount of time going to and from his place of work underground. Allowing for these other factors, how much time does the man actually spend at work and how long is he underground?

As interpreted in the union wage agreements, the 8-hour day means eight hours of labor at the usual working place, exclusive of time for lunch and exclusive of time spent in going from the entrance of the mine to the working place and back again. In general, this provision applies both to piece workers and day-wage workers underground, although certain classes of daymen have duties to be performed outside the eight hours. Motormen and drivers are ordinarily required to take motors and mules on their own time to and from the stables and the parting or station where they begin hauling, and this time is not counted as part of the day's labor.

Although the wage agreements specify eight hours of labor, it does not follow that men are always at work eight hours in the day. Shortage of railroad cars at the tipple, lack of orders, a petty strike, or a breakdown within the mine may cause it to stop work before the eight hours are over. Time workers may lose fractional days through sickness or accident. In particular, the tonnage men, who constitute 40 to 70 per cent of the working force, may leave early before the mine as a whole stops work, because the custom of the industry allows them that freedom. Only in the rarest instances is a record kept of the time these men are in the mine. Sometimes they leave because they have finished their allotted work for the day, sometimes because they feel sick or have other interests to attend to, or sometimes simply because they have earned enough for one day. The amount and the causes of this early quitting have been a subject of discussion and even of controversy between operators and employees.

The nominal working day, therefore, measures neither the length of time spent by the men at work nor the length of time they are underground, and it was not until recently that any figures on these points were available. In connection with its periodic surveys of miners' earnings, the Bureau of Labor Statistics arranged to have a special record kept of the time actually spent in the mine by many thousands of tonnage men during typical biweekly pay periods. The results, which show the time spent at the working place and also the total time in the mine, will be found in publications of the Bureau of Labor Statistics, United States Department of Labor, as follows: Monthly Labor Review for July, 1925, pages 68 to 87; for February, 1926, pages 77 to 87; and for October, 1931, pages 910 to 922; also Bulletins 316, 416, and 454.

OUTPUT PER MAN

TABLE 41.—*Coal produced per man per day and per year, by States, 1921–1930, in net tons*

[Calculated from the total production, including strip-mined coal and the total number of men employed above and below ground, excluding coke workers and office force]

State	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Per man per day:										
Alabama	2.93	3.01	2.93	3.11	3.00	2.89	3.10	3.09	3.08	3.38
Arkansas	3.03	3.32	3.39	3.24	2.99	3.00	3.05	2.79	2.70	2.87
Colorado	3.83	3.87	[1] 4.45	[1] 4.52	[1] 4.07	[1] 4.11	[1] 4.13	[1] 4.13	[1] 4.40	[1] 4.38
Illinois	4.80	5.05	5.02	5.16	5.33	5.31	5.36	5.57	6.06	6.42
Indiana	4.86	5.19	5.43	5.75	5.89	5.72	6.13	6.51	7.00	7.56
Iowa	2.69	2.55	2.75	2.80	3.02	2.85	2.96	3.02	2.98	3.18
Kansas	3.08	3.02	3.19	3.29	3.44	3.43	3.57	3.68	3.63	3.96
Kentucky	4.11	4.89	4.83	4.67	4.68	4.52	4.50	4.69	4.64	4.83
Maryland	3.27	3.15	3.42	3.27	3.61	3.56	3.70	3.50	3.28	3.50
Michigan	2.63	2.65	2.67	3.00	2.75	2.55	2.67	2.67	2.77	2.73
Missouri	2.50	2.88	3.07	3.08	3.18	3.27	3.26	3.47	3.87	4.07
Montana	4.57	5.03	5.00	5.26	6.64	7.14	6.99	7.93	7.90	8.45
New Mexico	3.58	3.61	3.28	3.25	3.68	3.54	3.38	3.70	3.79	3.85
NorthDakota	4.19	4.39	4.60	5.62	6.61	6.56	6.78	7.00	6.84	7.50
Ohio	4.60	4.92	4.95	4.82	4.67	4.56	4.52	4.28	4.64	4.67
Oklahoma	2.70	3.12	2.99	3.05	2.70	2.88	3.35	3.34	3.36	3.49
Pennsylvania bituminous	4.03	3.84	4.15	4.27	4.36	4.37	4.26	4.52	4.73	4.82
Tennessee	2.80	2.59	2.93	3.05	3.11	3.11	3.20	3.16	3.11	3.48
Texas	2.42	2.10	2.72	3.16	3.19	3.39	3.92	3.99	3.95	3.53
Utah [1]	6.10	5.18	6.73	5.70	5.90	6.65	6.84	7.57	7.07	7.23
Virginia	3.78	3.93	3.92	3.73	3.69	3.91	4.11	4.28	4.24	4.66
Washington	3.52	2.96	3.19	3.41	3.52	3.62	3.68	3.70	3.77	4.01
West Virginia	4.79	5.10	5.44	5.48	4.94	4.90	5.15	5.35	5.34	5.61
Wyoming	5.08	5.15	5.23	5.41	5.90	6.15	6.18	6.34	6.02	6.20
Total bituminous	4.20	4.28	4.47	4.56	4.52	4.50	4.55	4.73	4.85	5.06
Pennsylvania anthracite	2.09	[2] 2.31	2.21	2.00	2.12	2.09	2.15	2.17	2.17	2.21
Grand total	3.55	3.89	3.91	3.81	4.04	3.92	3.96	4.10	4.21	4.34
Per man per year:										
Alabama	487	647	680	684	738	768	716	685	712	638
Arkansas	340	269	329	433	335	407	418	406	394	331
Colorado	628	740	774	806	781	830	810	796	823	739
Illinois	729	606	795	765	860	914	609	871	1,069	1,002
Indiana	622	571	738	779	934	991	737	975	1,203	1,188
Iowa	398	334	498	452	464	522	337	529	581	493
Kansas	422	377	443	496	580	540	492	469	579	501
Kentucky	625	684	735	810	966	1,039	1,068	995	1,031	904
Maryland	392	318	608	565	753	836	814	813	805	688
Michigan	516	429	593	536	512	437	501	498	602	511
Missouri	415	326	477	415	527	571	492	626	717	676
Montana	654	704	896	909	1,136	1,157	1,378	1,517	1,493	1,449
New Mexico	536	779	708	662	742	890	849	788	811	679
North Dakota	813	769	837	925	1,013	1,064	1,139	1,236	1,310	1,351
Ohio	617	492	742	689	707	723	445	732	933	882
Oklahoma	380	356	398	379	413	526	659	563	597	322
Pennsylvania bituminous	609	592	882	772	873	981	865	983	1,089	956
Tennessee	431	422	536	487	656	728	752	715	709	681
Texas	336	389	484	523	478	661	793	809	838	639
Utah	922	1,057	1,077	1,037	1,056	1,234	1,432	1,445	1,492	1,215
Virginia	628	779	832	843	936	1,027	978	967	1,058	932
Washington	560	575	680	688	681	717	773	813	856	822
West Virginia	715	729	919	995	1,111	1,209	1,211	1,190	1,320	1,146
Wyoming	849	659	1,004	950	1,051	1,111	1,166	1,357	1,386	1,167
Total bituminous	627	609	801	781	884	966	872	959	1,064	948
Pennsylvania anthracite	567	[2] 349	592	550	386	511	485	469	487	460
Grand total	615	565	763	733	777	867	788	844	930	834

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[1] Probably too high because of practice common in some districts of men going into mine to shoot coa and load mine cars on days when tipples or mines, as a whole, are not in operation.

[2] Heavy washery output.

TABLE 42.—*Bituminous coal produced underground per man employed underground, by States, in 1930*

State	Total tons mined underground	Total number underground men	Average number days worked	Average tons per underground man	
				Per year	Per day
Alabama	15,395,581	20,877	189	737	3.90
Alaska	120,100	67	294	1,793	6.10
Arkansas	1,474,294	4,041	115	365	3.17
Colorado	8,196,910	9,503	169	863	[1] 5.11
Illinois	47,614,815	46,450	156	1,025	6.57
Indiana	10,850,750	10,862	157	999	6.36
Iowa	3,892,571	7,271	155	535	3.45
Kansas	1,383,328	3,739	126	370	2.94
Kentucky	50,865,497	49,192	187	1,034	5.53
Maryland	2,270,593	2,942	197	772	3.92
Michigan	661,113	1,188	187	556	2.97
Missouri	1,782,949	4,396	166	406	2.45
Montana	1,956,638	1,588	172	1,232	7.16
New Mexico	1,969,433	2,472	176	797	4.53
North Carolina	28,500	55	290	518	1.79
North Dakota	778,466	762	180	1,022	5.68
Ohio	21,433,775	22,595	189	948	5.01
Oklahoma	2,431,303	4,544	148	535	3.61
Pennsylvania	123,763,747	115,648	198	1,070	5.40
South Dakota	9,410	31	109	304	2.79
Tennessee	5,115,628	6,596	196	775	3.96
Texas	708,819	1,138	181	623	3.54
Utah	4,257,541	2,842	168	1,498	[1] 8.92
Virginia	10,907,377	9,970	200	1,094	5.47
Washington	2,301,928	2,380	205	967	4.72
West Virginia	121,472,638	91,127	204	1,333	6.53
Wyoming	6,005,522	4,316	188	1,391	7.40
Other States	34,714	150	128	231	1.80
	447,683,940	426,742	187	1,049	5.61

[1] See Table 41, footnote 1.

TABLE 43.—*Coal produced underground per man employed underground per day worked, 1911–1930, in net tons* [1]

Year	Anthracite [2]	Bituminous	Year	Anthracite [2]	Bituminous
1911	2.75	4.01	1921	2.70	4.86
1912	2.69	4.24	1922	2.87	4.98
1913	2.67	4.16	1923	2.70	5.15
1914	2.67	4.28	1924	2.53	5.17
1915	2.78	4.49	1925	2.60	5.09
1916	2.74	4.57	1926	2.53	5.07
1917	2.89	4.51	1927	2.58	5.11
1918	2.94	4.62	1928	2.60	5.26
1919	2.81	4.64	1929	2.64	5.42
1920	2.93	4.80	1930	2.63	5.61

[1] In making this computation certain estimates had to be made of the division of workers above and below ground and of the production of strip pits in the years 1911 to 1913. The probable error introduced by these estimates is too small to impair the value of the averages.

[2] Beginning with 1923, a small tonnage of culm-bank coal handled through breakers and hitherto counted as fresh-mined coal has been excluded, and the figures are therefore not exactly comparable with earlier years. The difference, however, is small. (See pp. 749 and 750.)

STRIKES, SUSPENSIONS, AND LOCKOUTS

TABLE 44.—*Men idle in strikes, suspensions, and lockouts and time lost thereby in comparison with time lost for other causes, 1920–1930*

[Includes both anthracite and bituminous-coal mines]

Year	Number of men on strike	Average number of days lost		Man-days lost—		
		Per man striking	Per man employed	On account of strikes, suspensions, and lockouts	On account of no market, car shortage, and similar difficulties [1]	Total
1920	282, 419	21	8	5, 914, 473	55, 732, 698	61, 647, 171
1921	151, 263	21	4	3, 106, 103	108, 332, 246	111, 438, 349
1922	603, 031	122	87	73, 497, 043	65, 186, 691	138, 683, 734
1923	197, 214	20	4	3, 868, 543	93, 359, 474	97, 228, 017
1924	129, 452	41	7	5, 362, 748	84, 963, 306	90, 326, 054
1925	186, 369	88	22	16, 433, 036	69, 624, 737	86, 057, 773
1926	174, 724	38	9	6, 707, 778	58, 424, 553	65, 132, 331
1927	193, 322	138	35	26, 675, 109	55, 488, 392	82, 163, 501
1928	86, 870	53	7	4, 605, 086	64, 379, 657	68, 984, 743
1929	58, 052	8	1	468, 453	55, 970, 492	56, 438, 945
1930	41, 000	27	2	1, 102, 758	72, 864, 839	73, 967, 597

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[1] Computed by the Bureau of Mines from the operators' reports of time worked, on the assumption that the potential working time was 308 days. For 1925 and 1926, however, the potential working time of the anthracite region has been assumed to be 304 days, and for 1927 to 1930, 303.5 days.

TABLE 45.—*Strikes, suspensions, and lockouts in coal mines, by States, in 1930*

State	Total number of men employed	Number of men on strike	Man-days idle on account of strike	Average number of days lost on account of strike	
				Per man employed	Per man on strike
Alabama	24, 393				
Arkansas	4, 626				
Colorado	11, 091				
Illinois	53, 603	9, 483	348, 779	7	37
Indiana	13, 881	2, 008	32, 003	2	16
Iowa	7, 901	591	3, 754	(1)	6
Kansas	4, 855				
Kentucky	56, 674	6, 436	562, 067	10	87
Maryland	3, 299				
Michigan	1, 294	630	2, 560	2	4
Missouri	5, 700	50	700	(1)	14
Montana	2, 085				
New Mexico	2, 902				
North Dakota	1, 258				
Ohio	25, 574	1, 143	12, 583	(1)	11
Oklahoma	5, 424				
Pennsylvania bituminous	130, 150	924	14, 689	(1)	16
Tennessee	7, 535				
Texas	1, 305				
Utah	3, 504				
Virginia	11, 709				
Washington	2, 801				
West Virginia	105, 988	1, 523	13, 215	(1)	9
Wyoming	5, 216	10	10	(1)	1
Other States	434				
Total bituminous	493, 202	22, 798	990, 360	2	43
Pennsylvania anthracite	150, 804	18, 202	112, 398	1	6
Grand total	644, 006	41, 000	1, 102, 758	2	27

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[1] One-half day or less

EQUIPMENT AND METHODS OF MINING AND PREPARATION

The economic difficulties of the bituminous industry in recent years have diverted attention from the brilliant progress it has made in the field of engineering. To record the rapid changes going on in both mining and preparation practice, the following section is devoted to statistics of the mechanical equipment of the mines. Because of the many kinds of equipment used it is planned to select one or more features for special analysis each year. In this way special attention was given to underground haulage equipment in the 1925 report,[7] to mechanical loading in 1926,[8] to screening equipment in 1927,[9] and to a general review of engineering progress in 1928.[10] During 1930 the subject selected for special analysis was mechanical loading.

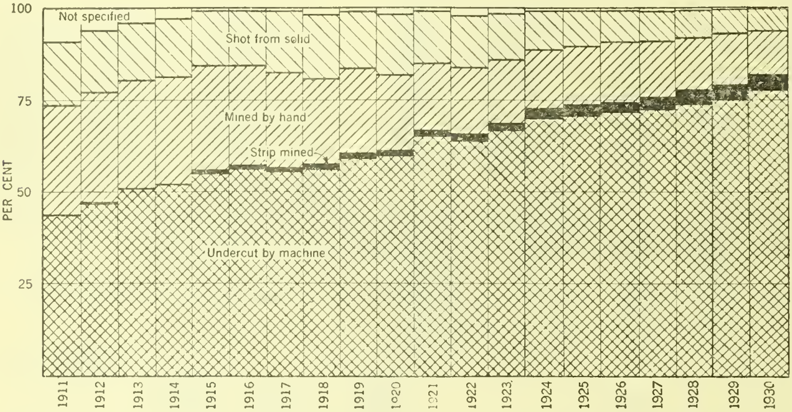

FIGURE 43.—Per cent of total output of bituminous coal mined by different methods, 1911-1930

In compiling such data no publicity is given to individual makes of equipment, but it is often possible to classify equipment by types and to show the relative growth and distribution of each type. Such information is useful to operators in selecting equipment and to manufacturers in establishing sales quotas and in gaging the future market.

Figure 43 records some of the outstanding changes in mining methods in recent years.

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[7] Coal in 1925, pp. 440-448. See also Rogers, H. O., Exit the Mule: Coal Age, August, 1927, vol. 32, pp. 84-88.

[8] Coal in 1926, p. 490. See also Tryon, F. G., Figures on Mechanical Production in Coal Fields of the United States: Min. Cong. Jour., June, 1928, pp. 413-416.

[9] Coal in 1927, pp. 384-394.

[10] Coal in 1928, pp. 481-490. See also Smith, George Otis, and Tryon, F. G., Development of the American Coal Industry, 1913-1928: World Eng. Cong., Tokyo, October, 1929.

METHODS OF RECOVERY

TABLE 46.—*Bituminous coal mined by different methods, by States, in 1930*

State	Mined by hand		Shot off the solid		Cut by machines		From strip pits		Not specified		Total production (net tons)
	Net tons	Per cent	Net tons	Per cent	Net tons	Per cent	Net tons	Per cent	Net tons	Per cent	
Alabama	1,499,950	9.6	2,521,019	16.2	11,359,939	73.0	174,477	1.1	14,673	0.1	15,570,058
Alaska	12,000	10.0	108,100	90.0							120,100
Arizona	2,000	22.0	7,084	78.0							9,084
Arkansas	372		591,716	38.6	882,206	57.5	59,140	3.9			1,533,434
Colorado	2,623,860	32.0	858,869	10.5	4,681,537	57.1			32,644	.4	8,196,910
Georgia			7,092	100.0							7,092
Illinois	929,767	1.7	4,627,451	8.6	41,925,893	78.0	6,116,415	11.4	131,704	.3	53,731,230
Indiana	82,956	.5	1,676,644	10.2	9,085,645	55.1	5,639,212	34.2	5,505		16,489,962
Iowa	515,942	13.2	2,152,824	55.3	1,185,627	30.5			38,178	1.0	3,892,571
Kansas	156,826	6.4	1,010,882	41.6	183,838	7.6	1,046,601	43.1	31,782	1.3	2,429,929
Kentucky:											
Eastern	989,775	2.4	2,320,996	5.8	36,973,059	91.8	2,000		7,864		40,293,694
Western	7,675	.1	778,025	7.1	9,783,603	89.6	341,498	3.1	4,500	.1	10,915,301
Maryland	1,559,940	68.7	98,293	4.3	606,161	26.7			6,199	.3	2,270,593
Michigan			3,931	.6	657,182	99.4					661,113
Missouri	338,069	8.8	402,744	10.5	1,001,595	26.0	2,070,201	53.7	40,541	1.0	3,853,150
Montana	42,762	1.4	234,503	7.8	1,648,775	54.6	1,065,366	35.2	30,598	1.0	3,022,004
New Mexico	924,074	46.9	612,437	31.1	428,736	21.8			4,186	.2	1,969,433
North Carolina	28,500	100.0									28,500
North Dakota	86,504	5.1	160,120	9.4	483,073	28.4	921,691	54.2	48,769	2.9	1,700,157
Ohio	402,144	1.8	175,519	.8	20,706,609	91.8	1,118,203	5.0	149,503	.6	22,551,978
Oklahoma	79,163	2.8	320,863	11.5	2,024,890	72.5	362,651	13.0	6,387	.2	2,793,954
Pennsylvania	28,734,328	23.1	3,392,143	2.7	91,571,746	73.6	699,040	.5	65,530	.1	124,462,787
South Dakota							3,400	26.5	9,410	73.5	12,810
Tennessee	380,811	7.4	1,211,725	23.6	3,522,341	68.7	14,800	.3	751		5,130,428
Texas	219,927	26.4	467,582	56.0	21,310	2.6	125,053	15.0			833,872
Utah	31,796	.8	[1] 643,707	15.1	3,582,038	84.1					4,257,541
Virginia	48,770	.4	1,440,065	13.2	9,418,542	86.4					10,907,377
Washington	1,297,354	56.4	552,125	24.0	449,851	19.5			2,598	.1	2,301,928
West Virginia	13,902,670	11.4	1,747,486	1.4	105,791,044	87.1			31,438	.1	121,472,638
Wyoming	591,973	9.7	966,626	15.9	4,446,923	73.0	82,611	1.4			6,088,133
Other States			14,978	80.8	3,000	16.2			560	3.0	18,538
	55,489,908	11.9	29,105,549	6.2	362,425,163	77.5	19,842,359	4.3	663,320	.1	467,526,299

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[1] Includes 397,258 tons reported by the companies as "pillar coal," the method of mining which of course differs materially from solid shooting in rooms or entries. Indeed, most of the coal reported as shot off the solid in Utah is probably "pillar coal."

UNDERCUTTING MACHINES

TABLE 47.—*Number of coal-cutting machines in bituminous-coal mines, average output per machine, and per cent of total product of underground mines cut by machines, by States, 1913, 1923, 1929, and 1930*

State	Number of coal-cutting machines in use				Average output per machine (net tons)				Per cent of total product of underground mines cut by machines			
	1913	1923	1929	1930	1913	1923	1929	1930	1913	1923	1929	1930
Alabama	377	395	407	409	10, 940	22, 067	29, 242	27, 775	23. 3	43. 8	67. 5	73. 8
Arkansas	27	40	96	117	9, 300	4, 769	8, 616	7, 540	11. 2	16. 6	51. 2	59. 8
Colorado	300	440	388	372	7, 705	11, 129	14, 371	12, 585	25. 0	47. 3	56. 2	57. 1
Illinois	1, 845	3, 151	2, 107	1, 850	17, 686	17, 191	21, 902	22, 663	53. 0	69. 4	83. 5	88. 1
Indiana	732	852	417	421	13, 302	16, 107	24, 058	21, 581	56. 7	59. 5	78. 8	83. 7
Iowa	28	81	96	100	4, 311	14, 584	13, 361	11, 856	1. 6	20. 7	30. 2	30. 5
Kansas	9	22	43	43	2, 458	4, 452	6, 099	4, 275	. 3	2. 6	13. 4	13. 3
Kentucky	1, 263	1, 928	1, 876	1, 812	11, 365	19, 559	29, 680	25, 804	73. 2	85. 8	92. 7	91. 9
Maryland	13	47	41	41	6, 384	12, 398	15, 783	14, 784	1. 7	25. 5	24. 4	26. 7
Michigan	130	80	61	52	6, 636	13, 579	12, 923	12, 638	70. 0	92. 7	97. 9	99. 4
Missouri	104	135	99	107	8, 307	7, 450	11, 302	9, 361	20. 0	39. 3	54. 7	56. 2
Montana	97	95	85	84	11, 099	15, 746	19, 993	19, 628	33. 2	47. 5	77. 6	84. 3
New Mexico	44	107	85	82	11, 297	7, 960	6, 744	5, 228	13. 4	29. 2	21. 9	21. 8
North Dakota	13	25	26	23	17, 094	17, 040	27, 464	21, 003	44. 9	42. 2	71. 3	62. 1
Ohio	1, 681	2, 351	1, 019	981	19, 418	15, 260	20, 594	21, 108	90. 2	95. 5	95. 7	96. 6
Oklahoma	103	183	183	193	6, 511	8, 943	13, 923	10, 492	16. 1	63. 6	77. 6	83. 3
Pennsylvania	6, 301	6, 481	4, 147	4, 142	14, 678	17, 020	24, 203	22, 108	53. 2	64. 7	70. 3	74. 0
Tennessee	252	171	137	147	7, 312	11, 692	23, 775	23, 962	26. 7	33. 1	60. 8	68. 9
Texas	24	5	2	2	4, 204	8, 904	11, 731	10, 655	4. 2	3. 7	3. 0	3. 0
Utah	50	192	145	136	12, 510	16, 778	27, 997	26, 339	19. 2	68. 2	78. 7	84. 1
Virginia	187	277	261	239	22, 497	31, 210	41, 845	39, 408	47. 6	73. 5	85. 7	86. 4
Washington	63	26	64	28	4, 453	9, 726	10, 923	16, 066	7. 2	8. 6	27. 7	19. 5
West Virginia	2, 539	3, 936	2, 718	2, 626	15, 500	21, 592	43, 710	40, 286	55. 3	79. 0	85. 8	87. 1
Wyoming	195	208	228	228	15, 645	18, 237	20, 580	19, 504	41. 3	50. 1	70. 8	74. 0
Other States	2	1	-------	2	600	5, 000	-------	1, 500	4. 8	13. 9	------	23. 3
	16, 379	21, 229	14, 731	14, 237	14, 801	17, 779	27, 398	25, 457	50. 7	68. 3	78. 4	81. 0

TABLE 48.—*Coal mined by undercutting machines, 1920–1930*

Year	Anthracite				Bituminous coal				Per cent of total product of underground mines cut by machines
	Machines in use	Quantity mined by undercutting machines (net tons)		Per cent of total fresh-mined product cut by machines	Machines in use	Quantity mined by undercutting machines (net tons)		Per cent of total product cut by machines	
		Total	Average per machine			Total	Average per machine		
1920	139	938, 073	6, 749	1. 1	19, 103	339, 813, 476	17, 788	59. 8	60. 7
1921	114	979, 145	8, 589	1. 1	19, 618	272, 702, 389	13, 901	65. 6	66. 4
1922	82	502, 793	6, 132	1. 0	20, 436	267, 032, 931	13, 067	63. 2	64. 8
1923	162	1, 208, 542	7, 460	1. 4	21, 229	377, 435, 543	17, 779	66. 9	68. 3
1924	212	1, 423, 884	6, 716	1. 7	18, 660	336, 271, 335	18, 021	69. 5	71. 5
1925	159	941, 189	5, 919	1. 6	17, 551	366, 725, 758	20, 895	70. 6	72. 9
1926	90	931, 650	10, 352	1. 2	17, 466	410, 912, 680	23, 526	71. 7	73. 8
1927	138	1, 171, 888	8, 492	1. 5	17, 388	374, 040, 637	21, 511	72. 2	74. 9
1928	193	1, 289, 809	6, 683	1. 8	15, 261	369, 687, 007	24, 224	73. 8	76. 9
1929	137	1, 159, 910	8, 466	1. 6	14, 731	403, 606, 717	27, 398	75. 4	78. 4
1930	185	1, 410, 123	7, 622	2. 1	14, 237	362, 425, 163	25, 457	77. 5	81. 0

STRIPPING OPERATIONS

TOTAL STRIPPED BY ALL METHODS

Because of the sharp differences between open-pit and underground mining, it is desirable for many purposes to separate the two in the statistical record. This is not feasible in the primary tables of this report showing production by counties (p. 664), because in many cases there is only one strip pit in a county and separation would disclose the business of individual companies. In Table 49, however, the reports of stripping operations in the bituminous fields are tabulated separately in as great geographic detail as possible. Corresponding figures for Pennsylvania anthracite are given in Table 26A, page 767.

Coal is recovered by stripping at three types of operations: (1) Small pits, without power shovels, where the overburden is removed by horse-drawn scrapers, or even by hand, and the coal itself is loaded by hand; (2) power strip pits proper, where the overburden and usually the coal also are handled by steam or electric shovels; and (3) mines combining stripping and underground methods in the same operation. All three types are included in Table 49, and as the returns for the combination strip and underground operations do not permit separating men engaged in other work from those engaged in stripping, the figures of men employed represent all persons working about the property, including those underground.

TABLE 49.—*Stripping operations of all types in the bituminous-coal fields, by States and counties, in 1930*

[For mines that recover coal both by stripping and by underground operations the returns do not permit separating men engaged in stripping from those engaged in other work. For this reason the figures of men employed represent all persons working at these mines, including those underground. The total tons produced by both methods at these same mines are also shown]

State and county	Number of strip pits	Number of shovels	Coal produced (net tons)		Total value at same mines	Average value per ton	Number of employees				Average number of days worked	Per cent of county or State total that was mined by stripping	Average tons per per man per day
			Mined by stripping	Total at same mines			Underground		Surface	Total			
							Miners, loaders, and shot firers	All others[1]					
Alabama: Blount and Walker	9	14	174,477	189,635	$412,000	$2.17	27	9	244	280	122	[2] 3.7	5.55
Illinois:													
Fulton, Henry, Jackson, La Salle, Livingston, Peoria, St. Clair, Saline, Vermilion, and Will	15	38	3,704,709	3,738,824	5,929,000	1.59	18	10	982	1,010	199	23.9	18.61
Perry	4	18	2,230,811	2,230,811	3,030,000	1.36	--------	--------	505	505	206	67.9	21.41
Williamson	10	2	180,895	180,895	334,000	1.85	--------	--------	85	85	131	4.5	16.22
State total	[3] 29	58	6,116,415	6,150,530	9,293,000	1.51	18	10	1,572	1,600	198	11.4	19.45
Indiana:													
Clay	4	11	568,773	568,773	848,000	1.49	--------	--------	280	280	217	60.3	9.38
Greene	4	8	935,669	935,669	1,453,000	1.55	--------	--------	233	233	236	54.3	17.02
Owen, Sullivan, Vermillion, Vigo, and Warrick	8	23	1,582,863	1,582,863	2,310,000	1.46	--------	--------	527	527	170	18.5	17.71
Pike	5	20	2,551,907	2,551,907	3,190,000	1.25	--------	--------	682	682	211	94.2	17.75
State total	21	62	5,639,212	5,639,212	7,801,000	1.38	--------	--------	1,722	1,722	203	34.2	16.17
Kansas:													
Bourbon	4	4	25,020	25,020	55,000	2.20	--------	--------	37	37	242	97.1	2.79
Cherokee	14	11	313,125	313,125	594,000	1.90	--------	--------	219	219	98	72.2	14.61
Crawford	23	22	708,456	708,456	1,458,000	2.06	--------	--------	484	484	124	38.9	11.76
State total	[3] 41	37	1,046,601	1,046,601	2,107,000	2.01	--------	--------	740	740	123	43.1	11.54
Kentucky: Hopkins, Letcher, and Muhlenberg	7	11	343,498	357,897	380,000	1.06	34	9	192	235	125	[2] 2.7	12.17

Missouri:													
Barton	13	25	1,382,089	1,382,089	2,798,000	2.02			515	515	149	91.2	18.06
Bates	3	5	378,942	378,942	721,000	1.90			120	120	184	88.2	17.18
Boone, Callaway, Jasper, Johnson, Ralls, St. Clair, and Vernon	9	14	93,533	93,533	224,000	2.39			154	154	96	49.6	6.34
Henry	3	4	215,637	215,637	410,000	1.90			70	70	193	93.0	15.97
State total	[3] 28	48	2,070,201	2,070,201	4,153,000	2.01			859	859	148	53.7	16.32
Montana: Rosebud	1	8	1,065,366	1,065,366	1,598,000	1.50			128	128	292	[2] 99.9	28.50
North Dakota:													
Bowman, Burleigh, Dunn, McKenzie, Mercer, Mountrail, Stark, and Ward	10	9	547,065	638,428	948,000	1.48	84	6	148	238	173	49.6	15.46
Burke	4	6	266,732	266,732	437,000	1.64			83	83	166	100.0	19.34
Grant	3	1	5,902	5,902	10,000	1.70			8	8	165	23.9	4.47
Hettinger	8		10,711	10,711	16,000	1.48			24	24	156	53.7	2.86
McLean	4	5	85,034	85,034	154,000	1.81			80	80	189	77.9	5.63
Morton	4		2,947	2,947	6,000	2.04			8	8	103	7.8	3.59
Oliver	3		3,300	3,300	5,000	1.52			6	6	183	100.0	3.00
State total	[3] 36	21	921,691	1,013,054	1,576,000	1.56	84	6	357	447	173	54.2	13.13
Ohio:													
Harrison	7	22	880,617	880,617	931,000	1.06			335	335	168	38.3	15.63
Hocking, Jefferson, Muskingum, Perry, and Stark	6	13	212,609	237,479	374,000	1.57	28	6	148	182	206	4.0	6.33
Tuscarawas	5	4	24,977	32,473	51,000	1.57	6	1	22	29	218	3.1	5.13
State total	[3] 18	39	1,118,203	1,150,569	1,356,000	1.18	34	7	505	546	183	5.0	11.48
Oklahoma: Haskell, Mayes, Muskogee, Rogers, Tulsa, and Wagoner	8	16	362,651	362,651	887,000	2.45			339	339	153	13.0	6.98
Pennsylvania:													
Allegheny, Beaver, Cambria, Clearfield, Fayette, Jefferson, and Somerset	8	10	466,069	1,225,148	2,423,000	1.98	258	186	333	777	271	.7	5.83
Washington	4	9	232,971	456,371	632,000	1.38	197	39	101	337	194	1.3	6.98
State total	[3] 12	19	699,040	1,681,519	3,055,000	1.82	455	225	434	1,114	247	.5	6.10
South Dakota: Corson and Perkins	[3] 3		3,400	3,400	8,000	2.35			7	7	204	26.5	2.38
Other States [4]	5	8	281,604	281,604	349,000	1.24			147	147	130	[2] 33.9	14.69
Grand total	218	341	19,842,359	21,012,239	32,975,000	1.57	652	266	7,246	8,164	185	4.3	13.92

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[1] Includes haulage and track men.

Per cent of county totals, not State.

[3] Includes some pits in which the stripping is done by hand.

[4] Arkansas, Tennessee, Texas, and Wyoming.

A larger proportion of the total bituminous-coal production was recovered by stripping methods in 1930 than ever before. The output of the strip pits during the year was 19,842,359 tons, or 4.3 per cent of the total soft-coal production. In the previous year the actual tonnage recovered by stripping operations was slightly higher, but it represented a smaller percentage of the total output. Table 50, which gives corresponding figures back to the beginning of the statistical record, brings out the extremely rapid growth that has characterized this branch of mining in the bituminous fields. In 1914 the quantity obtained by stripping was 1,280,946 tons, and in 1918 it was 8,288,245 tons. Even since the war, although production of the underground mines has shown no increase, the production of the strip mines has continued to grow by leaps and bounds. For the industry as a whole, the proportion of the output obtained by stripping is still small, but in some States of the Mississippi Valley it exceeds 50 per cent.

The stripping operations in the Pennsylvania anthracite region broke all previous records in 1930, with an output of 2,536,288 tons. This is an increase of 32.7 per cent in comparison with the previous year. As in the bituminous branch of the industry, however, the tonnage of hard coal recovered from strip pits represents a relatively small part of the total.

TABLE 50.—*Bituminous coal and anthracite mined by stripping operations of all types, 1914–1930*

[Note that coal stripped by horses, or in mines combining stripping and underground methods in the same operation, is included in this table]

Year	Bituminous coal			Pennsylvania anthracite			Total		
	Number of power shovels in use	Quantity mined by stripping		Number of power shovels in use	Quantity mined by stripping		Number of power shovels in use	Quantity mined by stripping	
		Net tons	Per cent of total output		Net tons	Per cent of fresh-mined output		Net tons	Per cent of total output
1914	48	1,280,946	0.3	(1)	(1)	(1)	(1)	(1)	(1)
1915	87	2,831,619	.6	57	1,121,603	(1)	144	3,953,222	0.7
1916	111	3,932,395	.8	105	1,987,800	1.4	216	5,920,195	1.0
1917	182	5,789,977	1.0	76	2,301,588	2.5	258	8,091,565	1.2
1918	276	8,288,245	1.4	82	2,360,183	2.6	358	10,648,428	1.6
1919	287	5,634,951	1.2	89	2,006,879	2.4	376	7,641,830	1.4
1920	312	8,859,553	1.5	96	2,054,441	2.5	408	10,913,994	1.7
1921	279	5,057,483	1.2	85	2,027,790	2.3	364	7,085,273	1.4
1922	379	10,208,884	2.4	69	949,745	1.9	448	11,158,629	2.4
1923	442	11,940,134	2.1	95	2,263,098	2.7	537	14,203,232	2.2
1924	420	13,606,954	2.8	95	1,865,677	2.2	515	15,472,631	2.7
1925	389	16,870,907	3.2	97	1,578,478	2.7	486	18,449,385	3.2
1926	410	16,922,695	3.0	99	2,401,356	3.0	509	19,324,051	3.0
1927	455	18,378,166	3.6	112	2,153,156	2.8	567	20,531,322	3.5
1928	415	19,788,577	4.0	108	2,422,924	3.4	523	22,211,501	3.9
1929	411	20,268,099	3.8	98	1,911,766	2.7	509	22,179,865	3.7
1930	341	19,842,359	4.3	108	2,536,288	3.7	449	22,378,647	4.2

(1) Not available.

POWER STRIP PITS PROPER

Of the 19,842,359 tons of bituminous coal and lignite recovered by stripping in 1930, approximately 66,000 tons was obtained by small horse-stripping operations, 838,000 tons by mines combining stripping and underground methods, and 18,938,344 tons by power strip pits proper. The horse-stripping operations have local importance only. The combination strip and underground operations are confined to a few special locations, chiefly in Pennsylvania and Alabama. The tendencies of strip mining can be studied much better in the record of the power strip pits proper, which is shown separately in Tables 51 and 52.

The causes of the rapid increase in the tonnage of soft coal obtained by stripping are fully discussed in a special study entitled "The Economics of Strip-Coal Mining," by O. E. Kiessling, F. G. Tryon, and L. Mann, published as Bureau of Mines Economic Paper 11. Among the subjects treated are the rapid growth of strip mining, postwar trends of wages and other costs, improvements in operating efficiency, improvements in quality of product, working time at strip mines, ratio of overburden to coal, and prospects for future expansion. The paper has been distributed to producers of strip coal. Additional copies may be obtained from the Superintendent of Documents, Washington, D. C., price 10 cents.

TABLE 51.—*Summary of operations of power strip pits proper in the bituminous-coal fields, by States, in 1930*

[Corresponding figures for each year from 1914 to 1928 are given in Bureau of Mines Economic Paper 11, pp. 27-32; and for 1929, in Coal in 1929, p. 756]

State	Number of strip pits	Number of power shovels	Amount mined by stripping (net tons) [1]	Average value per ton [2]	Number of men employed [2]	Average number of days worked [2]	Average tons per man per day [2]
Power strip pits proper: [3]							
Alabama	7	12	145,196	$2.28	239	119	5.25
Illinois	17	57	5,990,791	1.51	1,510	198	20.07
Indiana	21	62	5,639,212	1.38	1,722	203	16.17
Kansas	36	37	1,043,308	2.01	722	124	11.62
Kentucky	5	8	309,455	1.01	175	100	17.77
Missouri	27	48	2,067,709	2.01	854	147	16.45
Montana	1	8	1,065,366	1.50	128	292	28.50
North Dakota	9	19	799,110	1.56	258	192	16.11
Ohio	15	35	1,043,113	1.09	443	176	13.38
Oklahoma	8	16	362,651	2.45	339	153	6.98
Pennsylvania	5	12	190,829	1.14	102	255	7.34
Other States [4]	5	8	281,604	1.24	147	130	14.69
Total	156	322	18,938,344	1.54	6,639	176	16.18
Horse-stripping operations	46	---------	65,707	1.73	136	154	3.14
Mines combining stripping and underground methods in same operation [5]	16	19	838,308	1.84	1,389	229	6.31
Grand total	218	341	19,842,359	1.57	8,164	185	13.92

[1] Exclusive of coal produced by underground mining in the same operation.

[2] Items in these columns include underground mining conducted in the same operation.

[3] Includes a few operations in which a very small tonnage (never more than 10 per cent) was produced by underground methods. The total obtained by underground methods in this entire group was only about 24,000 tons.

[4] Includes Arkansas, Tennessee, Texas, and Wyoming.

[5] Includes all operations in which 10 per cent or more of the output was obtained by underground methods (including 4 small operations without power shovels). In addition to the 838,308 tons produced by stripping, this group of 16 mines obtained 1,165,335 tons by underground methods, its total production by both methods being 2,003,643 tons.

TABLE 52.—*Progress of power strip pits proper in the bituminous-coal fields, 1914 to 1930*

[Note that horse or hand stripping pits and mines combining stripping and underground methods in the same operation are excluded from this table]

Year	Number of power strip pits	Number of power shovels	Mined by stripping, net tons	Average value per net ton, f. o. b. mines	Average number of days worked	Number of men employed	Average tons per man per day
1914	35	48	1,280,946	(1)	187	1,355	5.1
1915	60	87	2,831,619	$1.18	199	2,445	5.9
1916	75	106	3,880,698	1.51	194	3,000	6.7
1917	105	155	5,483,957	2.34	171	4,916	6.6
1918	138	239	7,948,844	2.54	196	5,961	7.0
1919	145	256	5,386,478	2.33	154	5,628	6.4
1920	141	268	8,175,595	4.12	184	6,167	7.2
1921	125	240	4,606,239	2.87	112	4,961	8.3
1922	189	340	9,298,485	3.07	143	8,044	8.1
1923	197	380	11,087,157	2.31	140	8,490	9.3
1924	189	389	13,183,982	2.00	154	8,644	9.9
1925	179	363	16,497,260	1.84	175	8,430	11.2
1926	183	375	16,082,633	1.89	171	8,452	11.2
1927	207	424	17,867,253	1.90	177	9,131	11.0
1928	176	385	19,130,934	1.69	180	8,162	13.0
1929	170	397	19,766,777	1.57	170	8,257	14.1
1930	156	322	18,938,344	1.54	176	6,639	16.2

(1) Not available.

LOADING MACHINES AND CONVEYORS [11]

SUMMARY

From 37,862,000 tons in 1929 the production of bituminous coal by "mechanized mining" increased to 46,982,000 tons in 1930. This is a gain in one year of 9,120,000 tons, or 24.1 per cent. The increase is the more remarkable because it occurred in a time of acute business depression when the national demand for bituminous coal declined 12 per cent and when production by hand loading fell off 25 per cent. A better indicator of the growth of mechanization is the production mined mechanically, which increased from 7.1 per cent in 1929 to 10 per cent in 1930. Measured by this standard, the degree of mechanization in 1930 was nearly half again as great as in the preceding year.

These figures refer only to mechanical devices designed to reduce the labor of hand shoveling into mine cars, although in a larger sense the introduction of any machine, such as the cutting machine or the haulage locomotive, is a form of mechanization.

The statistics are based on replies to a question on the report card sent to all operators, inquiring whether loading machines were used in 1930. Every operator courteously reported the number and types of machines and the tonnage handled by each type. To make sure that every mine using mechanical loading was included, manufacturers of equipment were asked for lists of the mining companies to whom they had sold machines. The bureau especially appreciates the cooperation of the Pennsylvania Department of Mines, the Illinois Department of Mines and Minerals, the State coal-mine inspector of Wyoming, and Jonas Waffle of Indiana in furnishing information on operations in their States.

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[11] For an excellent summary of progress in mechanical loading, see the Coal Mine Mechanization Yearbook for 1930, published by the Am. Min. Cong.

The tonnage of bituminous coal produced by mechanized mining in 1930 is summarized in Table 53. The total of 46,982,000 tons relates only to operations underground. It does not include coal loaded by power shovels in strip pits, which amounted to approximately 20,000,000 tons in 1930. Neither does it include anthracite, of which 4,253,000 net tons were mined mechanically in 1930, according to the Pennsylvania Department of Mines.

Counting anthracite, the total coal handled by mechanized mining underground was thus 51,235,000 tons. If to this is added the 20,000,000 tons obtained by power stripping it appears that a grand total of not less than 71,000,000 tons was won mechanically either underground or in open pits.

It is also important to note that the figures in Table 53 represent production and not capacity. Because of the depression many mines were working short time; and besides, a considerable number of the machines used in 1930 were installed late in the year and so had little effect on the production for 1930.

Of the total tonnage handled mechanically, 42.7 per cent was loaded by mobile loading machines, 3.5 per cent by scraper loaders, 40.7 per cent by pit-car loaders, and 13.1 per cent by conveyors, including duckbills.

TABLE 53.—*Tonnage of bituminous coal produced by mechanized mining in 1930*

	Net tons	Per cent
Loaded by machine:		
Mobile loading machines	20,073,000	86.0
Scraper loaders	1,637,000	7.0
Duckbills and other self-loading conveyors	1,628,000	7.0
Total loaded by machine	23,338,000	100.0
Handled by conveyors:		
Duckbills and other self-loading conveyors	1,628,000	6.5
Pit-car loaders	19,116,000	75.6
Other hand-loaded conveyors	4,528,000	17.9
Total handled by conveyors	25,272,000	100.0
Recapitulation, less duplications:		
Mobile loading machines	20,073,000	42.7
Scrapers	1,637,000	3.5
Pit-car loaders	19,116,000	40.7
Conveyors, including duckbills	6,156,000	13.1
Grand total, mechanized mining	46,982,000	100.0

TONNAGE LOADED BY MACHINE AND TONNAGE SHOVELED ON CONVEYORS

The total quantity of bituminous coal loaded by machine in 1930 (see Table 54) was 23,338,000 tons. This includes all types of machines that eliminate hand shoveling except for incidental clean-up. In addition, 19,116,000 tons were shoveled by hand on pit-car loaders (locally often called "conveyors") and 4,528,000 tons on hand-loaded face conveyors. These devices, though not loading machines proper, greatly reduce the labor of hand shoveling by reducing the height to which the miner must lift the coal. When they are included, the total produced by mechanized mining in 1930 is 46,982,000 tons.

INCREASE BY TYPES OF MACHINES, 1929-30

In comparison with 1929 the total mechanized tonnage increased 24.1 per cent. Table 54 shows that all types of machines have contributed to this increase. The tonnage handled by mobile loading machines increased 22.2 per cent. Scrapers, which had barely held their own in the three years previous, increased slightly, while duckbills, including other types of self-loading conveyors, showed a gain of 24.4 per cent.

Somewhat larger increases were recorded by the devices involving hand shoveling. The phenomenal increase in pit-car loaders during the period when this device was invading the Illinois field could hardly be maintained, but for the country as a whole pit-car loaders showed a growth of 27.6 per cent in 1930. The tonnage handled by means of hand-loaded face conveyors increased 26.1 per cent.

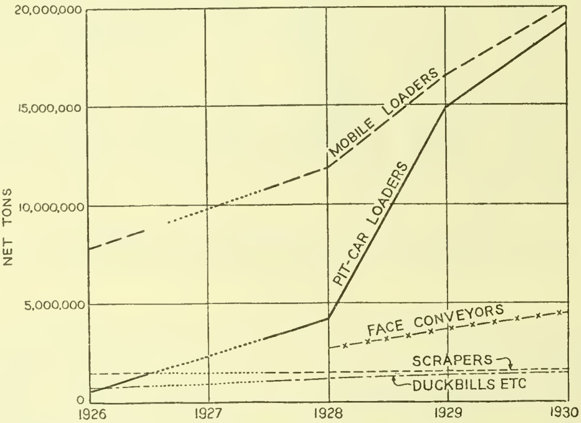

FIGURE 44.—Increase in tonnage of bituminous coal loaded mechanically, classified by types of machines, 1926-1930

TABLE 54.—*Comparative increase in tonnage handled by the principal types of machines, 1929 and 1930*

	1929 (net tons)	1930 (net tons)	Increase	
			Net tons	Per cent
Mobile loading machines	16, 432, 000	20, 073, 000	3, 641, 000	22. 2
Scraper loaders	1, 550, 000	1, 637, 000	87, 000	5. 6
Duckbills and other self-loading conveyors	1, 309, 000	1, 628, 000	319, 000	24. 4
Total loaded by machines	19, 291, 000	23, 338, 000	4, 047, 000	21. 0
Pit-car loaders	14, 979, 000	19, 116, 000	4, 137, 000	27. 6
Other hand-loaded conveyors	3, 592, 000	4, 528, 000	936, 000	26. 1
Grand total mechanized	37, 862, 000	46, 982, 000	9, 120, 000	24. 1

INCREASE IN MECHANICAL MINING, BY STATES, 1929-30

Because of the business depression the tonnage mined mechanically decreased in certain States, but in the majority there was a large increase. The fastest percentage growth was recorded in Alabama, where a number of new installations, especially of pit-car loaders, caused a gain of more than 120 per cent over the year preceding. Next in point of increase came Pennsylvania, with a gain of 66.2

per cent, followed by Montana with 57.5, Illinois with 25.2, Kentucky with 21.8, and "all other States" with 28.1 per cent. The small decreases in Wyoming, Utah, and the Virginias were chiefly due to the decline in total production, for in many districts in these States the percentage of the output attained by mechanized mining was higher than ever before.

TABLE 55.—*Increase or decrease in total tonnage mechanically mined, 1929 and 1930*

State	1929	1930	Increase or decrease	
			Net tons	Per cent
Illinois	18, 252, 000	22, 846, 000	+4, 594, 000	+25. 2
Indiana	3, 274, 000	3, 503, 000	+229, 000	+7. 0
Pennsylvania	4, 234, 000	7, 035, 000	+2, 801, 000	+66. 2
Wyoming	3, 002, 000	2, 865, 000	−137, 000	−4. 6
Utah	920, 000	862, 000	−58, 000	−6. 3
Montana	708, 000	1, 115, 000	+407, 000	+57. 5
Kentucky	812, 000	989, 000	+177, 000	+21. 8
West Virginia	2, 698, 000	3, 093, 000	−589, 000	−16. 0
Virginia	984, 000			
Alabama	934, 000	2, 056, 000	+1, 122, 000	+120. 1
Other States [1]	2, 044, 000	2, 618, 000	+574, 000	+28. 1
	37, 862, 000	46, 982, 000	+9, 120, 000	+24. 1

[1] Ohio, Washington, Arkansas, Colorado, Missouri, Oklahoma, Tennessee, Maryland, New Mexico, North Carolina, and Iowa.

PRODUCTION BY TYPES OF MACHINES, BY STATES

It is not feasible to show each type of machine in each State, for that would involve disclosure of individual operations. Table 56, however, breaks down the total into two major types. The first column shows the tonnage loaded without hand shoveling; that is, by mobile loading machines, scrapers, and duckbills. Illinois, with 10,005,000 tons, is far in the lead; second place is held by Pennsylvania; and third by Wyoming. The second column covers the machines that require hand shoveling; that is, pit-car loaders and hand-loaded face conveyors. In this group, also, Illinois is far in the lead, with 12,841,000 tons. Pennsylvania again is second, Indiana is third, and Alabama fourth.

In the total tonnage produced by mechanical mining of all types Illinois has first place, followed by Pennsylvania, Indiana, Wyoming, West Virginia (not including Virginia), Alabama, and Montana, in the order named.

TABLE 56.—*Total tonnage produced by loading machines, pit-car loaders, and conveyors, by States, in 1930*

State	Loaded by machine	Handled on pit-car loaders and hand-loaded conveyors	Total produced by mechanized mining
Illinois	10, 005, 000	12, 841, 000	22, 846, 000
Pennsylvania	2, 957, 000	4, 078, 000	7, 035, 000
Indiana	1, 713, 000	1, 790, 000	3, 503, 000
Wyoming	2, 448, 000	417, 000	2, 865, 000
West Virginia and Virginia	2, 245, 000	848, 000	3, 093, 000
Alabama	271, 000	1, 785, 000	2, 056, 000
Utah	842, 000	20, 000	862, 000
Kentucky	420, 000	569, 000	989, 000
Montana	926, 000	189, 000	1, 115, 000
Other States [1]	1, 511, 000	1, 107, 000	2, 618, 000
Total	23, 338, 000	23, 644, 000	46, 982, 000

[1] Ohio, Washington, Arkansas, Colorado, Missouri, Oklahoma, Tennessee Maryland, New Mexico, North Carolina, and Iowa.

RANK OF STATES IN PER CENT OF OUTPUT MECHANIZED

A fairer test of the progress of mechanization is the percentage of the total deep-mined output of the State which is produced by mechanized mining. Judged by this standard the high-wage-rate fields of the Rocky Mountains and the Middle West lead in the proportion mechanized. The honor of first place in 1930 was attained by Montana, in which 57 per cent of the deep-mined tonnage was won by mechanized mining. Next in rank came Wyoming and Illinois, with about 48 per cent, Indiana with 32.3 per cent, and Utah with 20.3 per cent. Among the Southern States, Alabama was far in the lead.

TABLE 57.—*Rank of States in percentage of total bituminous product of underground mines by mechanized mining in 1930*

State	Per cent loaded by machine	Per cent handled on pit-car loaders and hand-loaded conveyors	Total per cent mined mechanically
Montana	47.3	9.7	57.0
Illinois	21.0	27.0	48.0
Wyoming	40.8	6.9	47.7
Indiana	15.8	16.5	32.3
Utah	19.8	.5	20.3
Alabama	1.8	11.6	13.4
Pennsylvania	2.4	3.3	5.7
West Virginia and Virginia	1.7	.6	2.3
Kentucky	.8	1.1	1.9
United States	5.2	5.3	10.5

NUMBER OF MACHINES IN USE

The total number of machine-loading devices in use in 1930 was 835, of which 545 were mobile loading machines, 150 were scrapers, and 140 were duckbills or other self-loading conveyors. These figures do not include machines used for experimental purposes only or machines installed in mines that were idle throughout the year. The total number of pit-car loaders in use during 1930 was 2,876 and conveyors (other than pit-car loaders) were used in 143 mines.

During 1931 the percentage mechanized has undoubtedly been still higher. Thus, in some months of 1931 as much as 70 per cent of the Illinois tonnage has been mined mechanically.

LONG-TIME GROWTH OF MECHANIZATION

Figure 44 pictures the extremely rapid growth of mechanized mining. All types of machines have shown an increase since 1926, the first year of complete records. The greatest proportional increase has come in the pit-car loaders, which have jumped from 523,000 tons handled in 1926 to 19,116,000 in 1930. A very large increase is also shown in the mobile loader types, which still lead all other types in total tonnage handled.

For mechanical loading proper, as opposed to the types that involve hand shoveling onto the loader or conveyor, the record can be carried back to 1923. From 1,880,000 tons in 1923 the tonnage loaded mechanically without hand shoveling has increased to 23,338,000, a growth of twelvefold in 7 years.

TABLE 58.—*Mechanical loading underground in bituminous-coal mines, by States, in 1930*

State	Number of mines				Number of machines					Net tons mechanically mined			Total production of mechanized mines, in net tons			
	Using loading machines only (including scrapers, duckbills, etc.)	Using conveyors only (that is, pit-car loaders and hand-loaded conveyors)	Using both loading machines and conveyors	Total less duplications	Mobile loading machines	Scrapers	Duckbills and other self-loading conveyors	Pit-car loaders	Installations of hand-loaded conveyors [1]	Loaded by machine	Handled by pit-car loaders and hand-loaded conveyors	Total	Mines using loading machines only (including scrapers, duckbills, etc.)	Mines using conveyors only (that is, pit-car loaders and hand-loaded conveyors)	Mines using both loading machines and conveyors	Total, less duplications
Alabama	4	13	7	24	(2)	18	12	105	14	271, 402	1, 784, 650	2, 056, 052	831, 700	3, 711, 824	1, 097, 707	5, 641, 231
Arkansas	3	10	-----	13	-----	10	-----	-----	10	48, 600	196, 216	244, 816	80, 196	202, 289	-----	282, 485
Colorado	1	7	3	11	3	-----	8	13	6	(2)	(2)	122, 660	(2)	(2)	(2)	1, 443, 212
Illinois	7	36	26	69	255	(2)	(2)	1, 971	-----	10, 005, 082	12, 841, 473	22, 846, 555	4, 343, 440	11, 998, 202	11, 566, 027	27, 907, 669
Indiana	4	15	8	27	65	-----	-----	233	-----	1, 713, 390	1, 789, 793	3, 503, 183	516, 727	1, 486, 354	1, 946, 028	3, 949, 109
Iowa	-----	1	-----	1	-----	-----	-----	-----	(2)	-----	(2)	(2)	-----	(2)	-----	(2)
Kentucky	9	11	3	23	15	4	(2)	79	7	420, 266	568, 890	989, 156	2, 912, 206	2, 258, 707	288, 336	5, 459, 249
Maryland	-----	2	-----	2	-----	-----	-----	-----	(2)	-----	(2)	(2)	-----	(2)	-----	(2)
Missouri	-----	5	-----	5	-----	-----	-----	6	4	-----	109, 088	109, 088	-----	163, 479	-----	163, 479
Montana	4	4	2	10	27	-----	(2)	21	(2)	925, 769	188, 936	1, 114, 705	629, 754	285, 618	538, 504	1, 453, 876
New Mexico	3	-----	-----	3	-----	(2)	-----	-----	-----	(2)	-----	(2)	(2)	-----	-----	(2)
North Carolina	1	-----	-----	1	-----	1	-----	-----	-----	12, 000	-----	12, 000	28, 500	-----	-----	28, 500
Ohio	3	7	2	12	(2)	-----	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Oklahoma	-----	2	-----	2	-----	-----	-----	-----	(2)	-----	(2)	(2)	-----	(2)	-----	(2)
Pennsylvania	24	78	13	115	52	79	18	274	62	2, 957, 361	4, 077, 545	7, 034, 906	6, 897, 293	20, 235, 781	4, 878, 737	32, 011, 811
Tennessee	1	2	-----	3	-----	(2)	-----	(2)	(2)	(2)	(2)	53, 255	(2)	(2)	-----	455, 809
Utah	10	2	-----	12	31	3	-----	-----	(2)	841, 692	20, 000	861, 692	2, 794, 525	20, 000	-----	2, 814, 525
Virginia	2	5	-----	7	(3)	-----	-----	-----	5	(3)	(3)	864, 391	(3)	(3)	-----	2, 810, 668
Washington	-----	5	1	6	-----	-----	(2)	(2)	4	(2)	(2)	424, 206	-----	(2)	(2)	967, 973
West Virginia	19	25	4	48	[3] 40	15	8	80	13	[3] 2,245, 169	[3] 847, 623	2, 228, 401	[3] 7,142, 268	[3] 6,139, 050	1, 635, 150	12, 105, 800
Wyoming	7	7	10	24	33	10	77	65	3	2, 448, 012	416, 686	2, 864, 698	1, 426, 480	1, 000, 801	2, 479, 518	4, 906, 799
Undistributed	-----	-----	-----	-----	24	10	17	29	14	1, 449, 465	803, 190	1, 652, 534	2, 056, 168	3, 293, 982	1, 030, 050	3, 513, 206
	102	237	79	418	545	150	140	2, 876	142	23, 338, 208	23, 644, 090	46, 982, 298	29, 659, 257	50, 796, 087	25, 460, 057	105, 915, 401

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[1] Number of mines in which hand-loaded conveyors (other than pit-car loaders) were used.
[2] Included under "Undistributed" to avoid disclosing individual operations.
[3] West Virginia includes Virginia.

TABLE 59.—*Recapitulation of tonnage of bituminous coal handled by principal types of mechanical loading devices, 1923 to 1930*

[No figures have been published for 1927]

Type	1923	1924	1925	1926	1928	1929	1930
Mobile loading machines	[1]1,880,000	[1]3,496,000	[1]6,148,000	7,786,000	11,811,000	16,432,000	20,073,000
Scraper loaders				1,554,000	1,548,000	1,550,000	1,637,000
Duckbills and other self-loading conveyors				682,000	1,200,000	1,309,000	1,628,000
Total loaded by machine	1,880,000	3,496,000	6,148,000	10,022,000	14,559,000	19,291,000	23,338,000
Pit-car loaders	(2)	(2)	(2)	523,000	4,117,000	14,979,000	19,116,000
Other hand-loaded conveyors	(2)	(2)	(2)	(2)	2,883,000	3,592,000	4,528,000
Grand total, mechanized mining	(2)	(2)	(2)	10,545,000	21,559,000	37,862,000	46,982,000

[1] Separation by types not available before 1926.

[2] No data.

CONSUMPTION, STOCKS, AND DISTRIBUTION

CONSUMPTION

Consumption of coal fluctuates much less violently than production because of two factors, (1) the flow of coal in and out of storage and (2) the wide variations in the export trade.[12] In a year of normal business activity consumption of bituminous coal is in the neighborhood of 500,000,000 tons (see Tables 60 and 61), but during the past 13 years the annual consumption has ranged from a low of 391,849,000 tons in 1921, the year of postwar depression, to a high of 532,581,000 tons in 1926, when the demand was stimulated by a strike of the anthracite miners.

TOTAL CONSUMPTION IN 1930

The total consumption in 1930, allowing for imports, exports, and changes in stocks, amounted to 454,990,000 tons, a decrease of 12.4 per cent when compared with 1929 but 16.1 per cent higher than in 1921, the year of the last major depression. Table 61 and Figure 45 indicate how the decline was distributed among certain of the important consumers, and the explanation of why certain consumers were affected more than others has been covered in the summary. (See pp. 603 to 604.)

A running analysis of current changes in consumption by principal classes of consumers and major trade regions of the country is published in the weekly coal report of the Bureau of Mines.

CONSUMPTION BY USES IN A TYPICAL YEAR

A cross section of the demand in a typical year of industrial activity is given in Table 60. The figures for each item are the latest available, and for several of the most important uses they represent the year 1929. For steel works and general manufacturing, however, 1927 was used. For still another item no data are available since 1919. The allowance of 102,000,000 tons for "Domestic and all other uses" is an estimate and may be increased upon receipt of later information. The composite result, although not agreeing exactly with the total consumption, is believed to be typical of conditions when general business is normal.

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[12] White, C. P., and Tryon, F. G., The Flow of Bituminous Coal into Industry and Trade: Min. Cong. Jour., May, 1931, pp. 226–229.

TABLE 60.—*Consumption of bituminous coal by uses in a typical year of industrial activity*

Item	Year	Net tons consumed		Per cent of total	
Railroad fuel (all steam roads)[1]	1929				
Locomotive fuel		118, 600, 000		23. 7	
All other (shops, stations, etc.)		12, 500, 000		2. 5	
Total			131, 100, 000		26. 2
Coke ovens	1929				
By-product		76, 759, 000		15. 4	
Beehive		10, 028, 000		2. 0	
Total			86, 787, 000		17. 4
Electric utilities	1929		42, 785, 000		8. 6
Steel works[2]	1927				
Gas coal		8, 300, 000		1. 6	
Steam coal		14, 309, 000		2. 9	
Total			22, 609, 000		4. 5
General manufacturing[3]	1927				
Stone, clay, and glass products		24, 155, 000		4. 8	
Metal and metal products other than steel[4]		14, 814, 000		3. 0	
Food products (not including ice)		11, 239, 000		2. 2	
Chemicals and fertilizers		9, 803, 000		2. 0	
Paper, pulp, and printing		9, 515, 000		1. 9	
Textiles and their products		7, 865, 000		1. 6	
Petroleum refining		3, 632, 000		. 7	
Leather and rubber products		3, 777, 000		. 8	
Lumber and wood products		3, 140, 000		. 6	
Miscellaneous manufacturing industries		2, 506, 000		. 5	
Ice		1, 604, 000		. 3	
Total			92, 050, 000		18. 4
Coal-gas and water-gas plants[5]	1927		6, 252, 000		1. 3
Coal-mine fuel	1929		4, 662, 000		. 9
Mines and quarries other than coal	1919		4, 190, 000		. 8
Bunker	1929				
Foreign		4, 287, 000		. 8	
Domestic (incomplete)		3, 407, 000		. 7	
Total			7, 694, 000		1. 5
Domestic and all other uses[6]			102, 000, 000		20. 4
Grand total			500, 129, 000		100. 0

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[1] Based on records of Interstate Commerce Commission covering Class I roads. Includes allowance for Classes II and III, switching, and terminal companies.

[2] Total for iron blast furnaces, steel works, and rolling mills, as reported by Census of Manufactures and quarterly stock reports of Bureau of Mines.

[3] Other than steel, coke, gas, and railroad shops; from Census of Manufactures.

[4] Includes motor vehicles.

[5] Bituminous coal used for gas making and boiler fuel, not including that charged in by-product ovens operated by city gas companies.

[6] Includes heating large buildings other than factories, such as hotels, apartments, stores, offices, theaters, garages, and service stations; also, a number of other items that can not be separated, such as waterworks, construction industry, threshing, public institutions, central heating plants, laundries, and very small industrial consumers not covered by the Census of Manufactures. Because of inclusion of these items, the total for this group is not comparable with estimates of consumption for "domestic use" hitherto published.

LONG-TIME TREND OF CONSUMPTION

The former rapid growth of the demand for coal, which featured the years before the war, has been checked in recent years by advances in fuel economy; by competition of oil, gas, and water power; and by other factors. Table 61 shows the consumption of bituminous coal in each year since 1917, subdivided according to uses, as far as the available records permit. Information on several other classes of consumers is obtainable for certain census years, but the items shown are selected because they are reported each year in exactly comparable form. The known items are consumption for colliery fuel, electric-power generation, bunker fuel for ships in foreign trade, locomotive fuel on Class I roads, and manufacture of beehive and by-product coke. By subtracting these known items from the calculated total consumption, the total for "All other uses" is obtained. This covers consumption in manufacturing and for domestic and miscellaneous other purposes.

The changes from year to year are shown graphically in Figure 45.

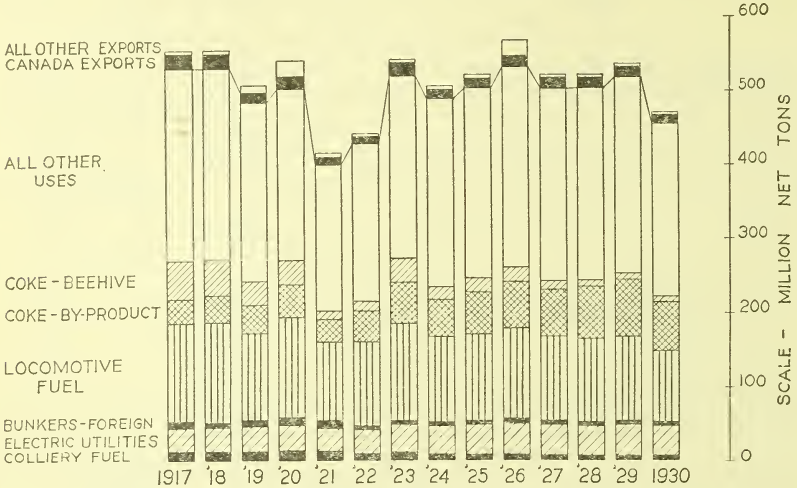

FIGURE 45.—Tonnage of bituminous coal absorbed by the principal branches of consumption, 1917–1930. The diagram shows that although there has been no great change in the aggregate consumption of bituminous coal during the past 14 years, shifts have occurred in many of the important uses. A marked decline has taken place in the consumption of colliery, bunker, and locomotive fuel, but these losses have been offset through increased consumption by the electric public utilities. The total quantity used for coke making at present is not greatly different from that in 1917, but the relative position of the beehive and by-product ovens has been reversed. In the group of "all other uses" a decline in manufacturing consumption has been offset by an increase in consumption for domestic use

TABLE 61.—*Changes in the United States consumption of bituminous coal by such classes of consumers as report currently, and by all other consumers, 1917 to 1930, in thousands of net tons*

[Information on several other classes of consumers is available for certain years. The items shown in this table are selected because they are available in strictly comparable form for each year]

Year	Consumed in the United States								Exported		Total of consumption and exports [7]
	Colliery fuel	Electric public utilities [1]	Bunkers, foreign trade [2]	Locomotive fuel, Class I roads [3]	Coke beehive ovens [4]	Coke by-product ovens [4]	All other uses [5]	Total consumption [6]	To Canada and Mexico	To all other countries	
1917	12, 117	[8] 33,500	7, 709	133, 421	52, 247	31, 506	258, 909	529, 409	18, 327	5, 512	553, 248
1918	12, 521	[8] 34,500	6, 189	134, 214	48, 160	36, 868	258, 141	530, 593	18, 316	4, 034	552, 943
1919	11, 062	[8] 35,100	8, 224	119, 692	29, 730	35, 857	241, 993	481, 658	12, 064	8, 050	501, 772
1920	11, 896	37, 124	10, 486	135, 414	31, 986	44, 205	237, 484	508, 595	16, 458	22, 059	547, 112
1921	9, 123	31, 585	8, 453	107, 910	8, 475	28, 713	197, 590	391, 849	13, 590	9, 541	414, 980
1922	7, 831	34, 179	4, 615	113, 163	13, 286	41, 053	212, 788	426, 915	10, 938	1, 475	439, 328
1923	8, 765	38, 966	5, 093	131, 492	30, 084	54, 276	250, 317	518, 993	16, 960	4, 494	540, 447
1924	6, 618	37, 556	4, 460	117, 247	15, 914	49, 061	253, 148	484, 004	12, 746	4, 354	501, 104
1925	5, 776	40, 222	4, 866	117, 714	17, 423	57, 110	256, 082	499, 193	13, 547	3, 915	516, 655
1926	5, 728	41, 311	7, 736	122, 823	19, 225	63, 647	272, 111	532, 581	13, 762	21, 510	567, 853
1927	4, 930	41, 888	4, 565	115, 883	11, 208	63, 240	258, 087	499, 801	14, 724	3, 288	517, 813
1928	4, 602	41, 350	4, 294	112, 382	7, 018	70, 166	259, 016	498, 828	14, 050	2, 114	514, 992
1929	4, 663	44, 937	4, 287	113, 894	10, 028	76, 759	264, 987	519, 555	14, 727	2, 702	536, 984
1930	3, 993	42, 898	3, 497	98, 400	4, 284	65, 521	236, 397	454, 990	13, 667	2, 210	470, 867

[1] U. S. Geological Survey. Includes a small amount of anthracite.

[2] Bureau of Foreign and Domestic Commerce.

[3] Interstate Commerce Commission. Note that consumption in shops, roundhouses, and stations is excluded, also the entire consumption of Class II and III roads.

[4] U. S. Bureau of Mines.

[5] Obtained by subtracting the known items from the total consumption. Includes general manufacturing, domestic, and many miscellaneous uses. From other sources it is known that consumption in steel works and general manufacturing is decreasing and that consumption for domestic uses is increasing.

[6] Production plus imports minus exports, plus or minus changes in consumers' stocks, as calculated in Table 3.

[7] Note that consumption includes the small amount imported.

[8] Estimated from 1917 Census of Electric Industries and incomplete data.

CONSUMPTION IN EACH STATE

Statistics of bituminous-coal consumption by States were published in Coal in 1917, part B, page 1254, and in Coal in 1918, part B, page 1366. Complete figures for all uses are not available by States for any later year; but certain larger items, such as coal charged in coke ovens, have been measured as recently as 1930. Table 62 assembles the latest information available concerning each item. For the very important item of consumption for domestic purposes no data by States have been collected since 1917. Manufacturing (other than coke) and consumption of mines and quarries are represented in the table by 1929.

The total consumption accounted for is 307,000,000 tons. This amount does not include railway and steamship fuel, which can not be apportioned by States, or a number of other items for which no data are available, such as waterworks, threshing engines, the construction industry, small manufacturing plants whose annual product is worth less than $5,000, custom gristmills and sawmills, power laundries, garages and service stations, and the heating of many large buildings.

TABLE 62.—*Bituminous coal consumed, by States, in net tons*

[Railway fuel and bunker fuel for steam vessels not included in this table]

State	Used at coal mines for steam and heat (1930)	Consumed in manufactures other than coke plants (1929) [1]	Consumed in the manufacture of by-product coke (1930)	Consumed in the manufacture of beehive coke (1930)	Consumed in electric utility power plants (1930) [2]	Consumed for domestic purposes (1917)	Consumed in mines and quarries other than bituminous coal mines (1929) [3]	Total consumption accounted for
Alabama	94, 197	1, 678, 555	5, 621, 183	----------	16, 046	651, 000	129, 049	8, 190, 030
Arizona	----------	230, 821	----------	----------	----------	65, 000	4, 052	299, 873
Arkansas	11, 389	113, 366	----------	----------	60, 592	300, 000	20, 859	506, 206
California	[4] 1, 525	32, 683	----------	----------	----------	355, 000	2, 816	392, 024
Colorado	180, 119	1, 201, 755	552, 639	122, 000	419, 295	1, 450, 000	106, 208	4, 032, 016
Delaware	----------	438, 244	----------	----------	17, 814	20, 000	1, 830	477, 888
Dist. of Col	----------	84, 727	----------	----------	349, 133	250, 000	----------	683, 860
Florida	----------	225, 512	----------	----------	25, 801	90, 000	36, 386	377, 699
Georgia	12	1, 153, 514	----------	----------	14, 426	871, 000	96, 761	2, 135, 713
Idaho	----------	137, 612	----------	----------	15	300, 000	21, 813	459, 440
Illinois	815, 688	13, 934, 989	5, 144, 535	----------	5, 551, 563	9, 721, 000	206, 273	35, 374, 048
Indiana	311, 343	7, 975, 181	6, 899, 911	----------	2, 596, 025	3, 500, 000	132, 607	21, 415, 067
Iowa	56, 015	2, 365, 724	----------	----------	1, 046, 489	2, 912, 000	34, 947	6, 415, 175
Kansas	32, 859	600, 105	----------	----------	307, 935	1, 800, 000	14, 414	2, 755, 313
Kentucky	379, 469	2, 463, 199	(5)	----------	610, 085	1, 864, 000	63, 808	5, 380, 561
Louisiana	----------	204, 274	----------	----------	617	370, 000	8, 485	583, 376
Maryland	10, 720	1, 587, 729	1, 628, 815	----------	636, 699	352, 000	44, 170	4, 260, 133
Michigan	31, 116	9, 002, 574	3, 690, 540	----------	2, 125, 983	2, 974, 000	952, 480	18, 776, 693
Minnesota	----------	1, 810, 540	937, 738	----------	659, 781	2, 637, 000	469, 807	6, 514, 866
Mississippi	----------	514, 003	----------	----------	61, 443	300, 000	7, 658	883, 104
Missouri	53, 817	3, 550, 058	(5)	----------	1, 248, 197	3, 000, 000	180, 608	8, 032, 680
Montana	39, 902	430, 406	----------	----------	11, 973	885, 000	90, 273	1, 457, 554
Nebraska	----------	690, 082	----------	----------	513, 383	1, 425, 000	2, 927	2, 631, 392
Nevada	----------	41, 897	----------	----------	----------	100, 000	114, 931	256, 828
New England:								
Maine	----------	1, 218, 401	----------	----------	8, 144	[6] 1,655,000	4, 284	[6] 15,167,053
New Hampshire	----------	553, 596	----------	----------	60, 568		6, 067	
Vermont	----------	244, 163	----------	----------	194		15, 513	
Massachusetts	----------	3, 963, 123	[6] 2,065,451	----------	1, 486, 306		21, 577	
Connecticut	----------	2, 031, 819		----------	885, 567		17, 465	
Rhode Island	----------	614, 854		----------	313, 516		3, 445	

[1] Census of Manufactures, 1929.

[2] From report of Division of Power Resources, U. S. Geological Survey.

[3] Fifteenth Census of the United States, Census of Mines and Quarries, 1929. From the census figures on total quantities of bituminous coal consumed by mines and quarries have been deducted the census figures on quantities consumed by bituminous-coal mines.

[4] Includes tonnage for Idaho and Oregon.

[5] Coal used in the manufacture of coke from Census of Manufactures 1929 included in column 2.

[6] Total for New England. Consumption by individual States can not be shown.

TABLE 62.—*Bituminous coal consumed, by States, in net tons*—Continued

State	Used at coal mines for steam and heat (1930)	Consumed in manufactures other than coke plants (1929)	Consumed in the manufacture of by-product coke (1930)	Consumed in the manufacture of beehive coke (1930)	Consumed in electric utility power plants (1930)	Consumed for domestic purposes (1917)	Consumed in mines and quarries other than bituminous coal mines (1929)	Total consumption accounted for
New Jersey	----------	4,361,802	1,276,961	----------	1,914,575	90,000	35,518	7,678,856
New Mexico	59,758	79,349	----------	----------	35,819	175,000	183,073	532,999
New York	----------	9,877,369	5,566,445	----------	6,420,880	1,242,000	128,517	23,235,211
North Carolina	2,760	1,552,436	----------	----------	370,407	820,000	47,762	2,793,365
North Dakota	19,340	230,629	----------	----------	288,330	655,000	19,824	1,213,123
Ohio	112,328	17,526,458	9,102,876	----------	4,364,262	4,900,000	240,698	36,246,622
Oklahoma	38,858	142,048	----------	----------	434,426	775,000	34,395	1,424,727
Oregon	----------	68,149	----------	----------	307	225,000	739	294,195
Pennsylvania	944,138	21,497,099	18,776,490	3,018,669	5,624,066	1,836,000	211,513	51,907,975
South Carolina	----------	852,445	----------	----------	164,006	480,000	21,125	1,517,576
South Dakota	----------	126,148	----------	----------	126,789	570,000	43,580	866,517
Tennessee	54,754	2,294,479	137,706	47,469	136,602	1,211,000	149,719	4.031,729
Texas	12,444	361,488	----------	----------	373,338	650,000	39,845	1,437,115
Utah	7,849	486,964	414,358	11,093	41,588	815,000	84,066	1,860,918
Virginia	35,947	2,113,633	----------	360,896	813,627	906,000	43,359	4,273,462
Washington	33,983	574,153	59,837	15,928	8,500	650,000	25,822	1,368.223
West Virginia	462,528	2,909,501	2,121,745	708,089	1,695,009	475,000	70,380	8,442,252
Wisconsin	----------	6,304,746	(5)	----------	955,597	2,532,000	33,724	9,826,067
Wyoming	188,702	156,371	----------	----------	102,349	250,000	12,424	709,846
Total	3,991,560	130,608,773	63,995,230	4,284,144	42,898,067	57,104,000	4,237,596	307,119,370

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[5] Coal used in the manufacture of coke from Census of Manufactures 1929 included in column 2.

FUEL ECONOMY

Competition from other sources has not alone been responsible for checking the growth in the demand for coal. Of equal significance has been the remarkable advance in efficiency of fuel utilization. (See Tables 63 to 67.) The history of the steam engine is a record of successive economies in fuel consumption, but it is clear that improvement in general practice has been especially marked since the World War. Figure 46 strikingly illustrates the economies that have been effected since the war by four of the most important consumers.

The most spectacular progress is shown by the electric public utilities, whose consumption of coal per kilowatt-hour of electricity generated has declined from 3.2 pounds in 1919 to 1.62 pounds in 1930. In other words, during the past decade the consumption of coal per unit of electricity generated has been practically cut in half. Hardly less remarkable is the record of the Class I railroads, which shows that the consumption of coal per thousand gross ton-miles has been reduced from 176 pounds in 1917 to 121 pounds in 1930, a decrease of 31.3 per cent. In the iron and steel industry the consumption of coking coal per gross ton of pig iron made has declined from 3,577 pounds in 1918 to 2,979 pounds in 1930, a decrease of 16.7 per cent. Still further evidence of the increase in fuel efficiency is afforded by the rapid rise of the by-product coke oven, which not only recovers a larger percentage of the coal charged in the form of merchantable coke than the beehive oven but also effects enormous savings in heat values through the recovery of gas, tar, light oils, and breeze.

It is generally admitted that the present rate of advance in fuel efficiency can not continue indefinitely. The progress since the war has been largely a taking up of slack, a general application of practices already in use at the better plants. Nevertheless, there is no sign that the advance will terminate abruptly. All branches of consumption shown in Tables 63 to 67 achieved fresh savings in 1930, and there is much room for further improvement merely in bringing average practice nearer to the level of what the best plants have already demonstrated to be possible.

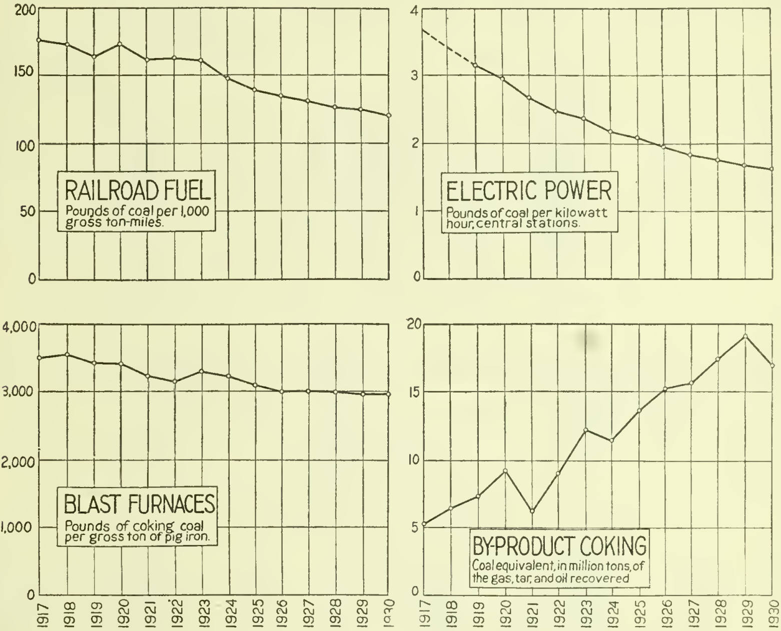

FIGURE 46.—Trends in fuel efficiency in the United States, 1917–1930

The subject is discussed more fully in Coal in 1927, pages 415 to 421, and in a special study prepared for the World Power Conference.[13]

TABLE 63.—*Indicators of the effect of fuel economy on consumption of coal per unit of performance since the war*

	Pounds	Reduction (per cent)
Steam railroads:		
Pounds per 1,000 gross ton-miles freight service—		
Average, 1919–20	170	
Average, 1930	121	28.8
Pounds per passenger-train car-mile—		
Average, 1919–20	18.5	
Average, 1930	14.7	20.5
Electric public-utility power plants:		
Pounds per kilowatt-hour, 1919	3.2	
Pounds per kilowatt-hour, 1930	1.62	49.4
Iron and steel—pounds coking coal per ton of pig: [a]		
1918	3,577	
1930	2,979	16.7
Coke manufacture: Savings of heat values through recovery of gas, tar, light oils, and breeze by extension of by-product in place of beehive coking, 1913 to 1930, expressed as per cent of coal used for all coke in 1930 [b]		20.5

[a] Includes only savings through higher yields of merchantable coke per ton of coal charged and lower consumption of coke per ton of iron. Excludes economies through recovery of by-products, which are treated in next item.

[b] These by-products are used in part for boiler fuel, in part for metallurgical purposes, in part for domestic heating and cooking, and to a small extent for automotive fuel.

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[13] Tryon, F. G., and Rogers, H. O., Statistical Studies of Progress in Fuel Efficiency: Trans. Second World Power Conference, Berlin, 1930, vol. 6, pp. 343–365.

TABLE 64.—*Fuel efficiency of electric public-utility power plants in the United States, 1919–1930*

[From reports of division of power resources, U. S. Geological Survey]

Year	Kilowatt-hours generated (millions)			Per cent of total		Fuel consumed, coal and coal equivalent (net tons)	Pounds of fuel consumed by fuel stations	
	By water	By fuel[1]	Total	By water	By fuel		Per kilowatt-hour	Per horsepower-hour
1919	14,606	24,315	38,921	37.5	62.5	38,880,000	3.2	2.4
1920	16,150	27,405	43,555	37.1	62.9	41,420,000	3.0	2.2
1921	14,970	26,005	40,975	36.5	63.5	35,240,000	2.7	2.0
1922	17,207	30,447	47,654	36.1	63.9	38,000,000	2.5	1.9
1923	19,343	36,322	55,665	34.8	65.2	43,522,000	2.4	1.8
1924	19,969	39,044	59,013	33.8	66.2	43,130,000	2.2	1.64
1925	22,356	43,514	65,870	33.9	66.1	44,780,000	2.1	1.57
1926	26,189	47,602	73,791	35.5	64.5	45,856,000	1.95	1.46
1927	29,875	50,330	80,205	37.2	62.8	45,910.000	1.84	1.37
1928	34,696	53,154	87,850	39.5	60.5	46,387,000	1.76	1.31
1929	34,629	62,723	97,352	35.6	64.4	52,574,000	1.68	1.25
1930	33,021	62,915	95,936	34.4	65.6	50,654,000	1.62	1.21

[1] Includes power generated from wood, which in 1930 amounted to 401,000,000 kilowatt-hours. This is excluded in the calculation of total fuel consumed and average consumption per kilowatt-hour and horsepower-hour given in the last 3 columns.

TABLE 65.—*Fuel efficiency of locomotives in road service on Class I steam railroads, 1916–1930*

[From reports of the Interstate Commerce Commission, except as noted. The figures include the coal equivalent of other fuel]

Year	Pounds of coal per 1,000 gross ton-miles, including locomotive and tender	Pounds of coal per passenger-train car-mile	Year	Pounds of coal per 1,000 gross ton-miles, including locomotive and tender	Pounds of coal per passenger-train car-mile
1916	[1] 169	[1] 18.5	1924	149	17.0
1917	[1] 176	[1] 19.4	1925	140	16.1
1918	[1] 174	[1] 19.2	1926	137	15.8
1919	[1] 164	[1] 18.1	1927	131	15.4
1920	[2] 174	[2] 18.8	1928	127	15.0
1921	162	17.7	1929	125	14.9
1922	163	17.9	1930	121	14.7
1923	161	18.1			

[1] From reports of the fuel conservation section of the United States Railroad Administration, prepared under direction of Eugene McAuliffe. These reports gave the consumption per 1,000 gross ton-miles, excluding locomotive and tender, from which the ratio used above has been estimated.

[2] Estimated from the ratio per 1,000 gross ton-miles, excluding locomotive and tender, which bears a practically constant relation to the other.

TABLE 66.—*Fuel economy as indicated by the coal equivalent of the thermal by-products of coking in by-product ovens, 1913–1930*

[By-products included are coke breeze, which is not generally recovered in the manufacture of beehive coke, surplus gas not used in heating ovens, tar, and light oil]

Year	Equivalent coal (net tons)	Per cent which this forms of total coal made into coke	Increase in coal equivalent over 1913	Year	Equivalent coal (net tons)	Per cent which this forms of total coal made into coke	Increase in coal equivalent over 1913
1913	2,600,000	3.8		1922	9,058,000	16.7	+6,458,000
1914	2,461,000	4.8	−139,000	1923	12,417,000	14.7	+9,817,000
1915	3,280,000	5.3	+680,000	1924	11,628,000	17.9	+9,028,000
1916	4,375,000	5.4	+1,775,000	1925	13,786,000	18.5	+11,186,000
1917	5,432,000	6.5	+2,832,000	1926	15,394,000	18.6	+12,794,000
1918	6,785,000	8.0	+4,185,000	1927	15,642,000	21.0	+13,042,000
1919	7,575,000	11.5	+4,975,000	1928	17,426,000	22.6	+14,826,000
1920	9,316,000	12.2	+6,716,000	1929	19,262,000	22.2	+16,662,000
1921	6,461,000	17.4	+3,861,000	1930	16,923,000	24.2	+14,323,000

TABLE 67.—*Fuel economy in manufacture of pig iron, 1912–1930*

Year	Pounds coke per gross ton pig iron and ferro-alloys [1]	Yield of coke from coal (per cent)	Pounds coal per gross ton of pig iron and ferro-alloys (column 1 divided by column 2)	Year	Pounds coke per gross ton pig iron and ferro-alloys [1]	Yield of coke from coal (per cent)	Pounds coal per gross ton of pig iron and ferro-alloys (column 1 divided by column 2)
1912	2,436.5	67.1	3,631.1	1922	2,176.3	68.3	3,186.4
1913	2,433.3	66.9	3,637.2	1923	2,243.3	67.5	3,323.4
1914	2,354.4	66.9	3,519.3	1924	2,212.0	68.1	3,248.2
1915	2,252.0	67.2	3,351.2	1925	2,150.4	68.8	3,125.6
1916	2,285.3	66.8	3,421.1	1926	2,091.2	68.6	3,048.4
1917	2,339.7	66.4	3,523.6	1927	2,122.3	68.6	3,093.7
1918	2,375.2	66.4	3,577.1	1928	2,088.5	68.4	3,053.4
1919	2,310.2	67.4	3,427.6	1929	2,058.6	69.0	2,983.5
1920	2,305.6	67.4	3,420.8	1930	2,046.8	68.7	2,978.5
1921	2,200.6	68.0	3,236.2				

[1] According to annual report, American Iron and Steel Institute. No data were published prior to 1912.

STOCKS OF COAL HELD BY CONSUMERS

Although there are frequently heavy accumulations of unbilled loads at the mines the practice of mine storage is not generally followed by the bituminous-coal operators. By far the largest element in bituminous reserves is the tonnage in the hands of commercial consumers and retail coal dealers. During the 14 years covered by statistical records the commercial reserves have ranged from 20,000,000 to 75,000,000 tons, but in 1930 they fluctuated within rather narrow limits. From 40,300,000 tons on January 1 the reserves dropped to 32,200,000 tons on July 1, but with the approach of colder weather there was a normal seasonal advance, and the year closed with stocks at 37,200,000 tons, or 3,100,000 tons less than at the beginning. (See Table 68.)

No record in tons is available of the total stocks of anthracite, but the last column of Table 68 shows the number of days supply in the yards of a representative group of retail dealers.

TABLE 68.—*Stocks of bituminous coal in hands of commercial consumers and stocks of anthracite and bituminous coal in retail dealers' yards, 1916–1930*

[From periodic stock reports of the Bureau of Mines. Coal for steamship fuel, on lake docks, in transit, and in the bins of householders is not included]

Date	Total stock of bituminous coal estimated (tons) [1]	Days' supply at current rate of consumption on date of stock taking								
		By-product coke plants	Steel plants	Other industrials	Coal-gas plants	Electric utilities	Coal dealers, bituminous	Railroads	Total bituminous	Anthracite in retail yards
1916—Oct. 1	27,000,000	(2)	25		(2)	(2)	(2)	20	(3)	(2)
1917—Oct. 1	28,100,000	(2)	27		(2)	(2)	(2)	18	(4)	(2)
1918—July 15	39,700,000	28	27	48	72	39	15	25	31	(2)
Oct. 1	59,000,000	32	45	71	84	47	28	29	43	(2)
Armistice Day (Nov. 11)	63,000,000	35	45	71	85	49	37	31	45	(2)
1919—Jan. 1	57,900,000	32	42	65	81	49	39	32	42	36
Apr. 1	40,400,000	23	35	47	58	48	25	(2)	31	31
1920—Mar. 1	24,000,000	15	9	27	31	21	13	11	18	21
June 1	20,000,000	8	11	24	22	22	10	10	15	15
1921—Jan. 1	45,800,000	29	42	64	55	44	30	23	39	24
Apr. 1	39,500,000	28	38	47	66	48	26	24	36	36
Aug. 1	41,000,000	31	46	56	79	44	42	32	39	50
Nov. 1	48,500,000	38	46	67	87	54	46	31	43	47
1922—Jan. 1	48,000,000	42	48	51	89	51	33	35	41	44
Mar. 1	52,500,000	39	48	56	82	54	23	42	43	28
Apr. 1	[5] 63,000,000	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Sept. 1	22,000,000	11	12	32	34	26	11	13	17	5
Oct. 1	26,000,000	14	17	33	38	30	18	15	21	7
Nov. 1	32,000,000	18	21	39	55	32	21	13	23	11
1923—Jan. 1	36,000,000	19	27	40	60	33	18	16	26	11
Mar. 1	36,000,000	19	26	34	58	34	11	16	22	6
July 1	46,000,000	26	35	46	89	48	39	28	37	25
Aug. 1	52,000,000	27	35	54	104	52	45	39	44	25
Sept. 1	56,000,000	30	33	56	110	52	38	44	46	21
Oct. 1	60,000,000	33	39	56	91	49	36	41	45	22
1924—Jan. 1	62,000,000	35	43	55	91	51	34	44	46	37
June 1	51,000,000	34	56	53	88	63	40	50	49	49
Sept. 1	47,000,000	30	42	48	90	58	46	42	45	58
1925—Jan. 1	[5] 45,000,000	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Mar. 1	44,000,000	25	30	40	78	51	33	35	37	46
June 1	38,000,000	20	27	32	68	48	31	32	32	52
Sept. 1	43,000,000	22	30	30	67	43	27	28	32	53
Nov. 1	48,000,000	26	32	44	78	46	30	30	35	27
1926—Jan. 1	49,000,000	26	28	39	72	48	20	27	30	32
Feb. 1	45,000,000	23	26	37	67	47	17	25	28	18
Apr. 1	40,000,000	21	24	32	60	46	14	23	26	30
May 1	36,000,000	20	25	36	71	54	31	25	31	33
July 1	39,000,000	23	26	35	72	52	43	27	34	40
Aug. 1	41,000,000	24	32	35	61	45	31	30	33	44
Oct. 1	43,000,000	26	37	37	70	45	32	33	35	46
1927—Jan. 1	55,000,000	34	50	41	69	47	23	33	37	54
Apr. 1	75,000,000	38	73	62	77	70	24	59	53	39
July 1	63,400,000	40	59	64	87	76	48	54	54	50
Aug. 1	60,100,000	39	63	63	91	69	41	50	53	57
Oct. 1	61,900,000	40	58	62	93	69	43	48	53	60
Nov. 1	61,300,000	42	50	52	81	61	34	43	46	60
1928—Jan. 1	55,500,000	38	45	44	79	58	27	41	41	57
Feb. 1	51,500,000	29	36	41	81	62	22	38	36	42
Apr. 1	48,300,000	25	35	39	74	60	17	40	34	25
July 1	41,700,000	23	38	37	63	62	43	37	38	55
Oct. 1	41,100,000	27	31	37	72	56	33	29	35	57
Nov. 1	42,400,000	26	34	33	71	51	28	27	30	53
1929—Jan. 1	41,800,000	27	34	33	72	53	26	26	31	54
Apr. 1	36,000,000	19	25	26	57	50	17	23	25	34
July 1	33,100,000	21	26	27	55	50	42	20	28	59
Oct. 1	37,500,000	26	27	32	64	44	35	20	30	55
Nov. 1	39,800,000	28	30	31	64	44	25	20	28	48
1930—Jan. 1	40,300,000	30	31	32	67	45	23	21	28	44
Feb. 1	37,700,000	26	26	30	65	46	20	21	27	35
Apr. 1	33,100,000	22	25	26	58	44	16	19	23	31
July 1	32,200,000	25	31	29	61	49	51	20	31	57
Aug. 1	33,100,000	29	33	34	66	47	36	21	32	60
Oct. 1	35,900,000	32	32	36	68	50	44	22	35	61
Nov. 1	36,800,000	38	35	31	63	47	29	22	31	47
Dec. 31	37,200,000	38	37	31	65	47	27	24	31	43

[1] The figures for 1918 in this table are based upon an actual count. Beginning with Apr. 1, 1919, the figures are based upon reports from a selected list of 5,000 consumers whose stocks in 1918 bore a known relation to the known total stocks.

[2] No data.

[3] Data incomplete. Estimated as 22 days.

[4] Data incomplete. Estimated as 21 days.

[5] No canvass of consumers was made on this date. The total was estimated from stocks reported in the preceding canvass.

DISTRIBUTION

Tables of the movement of coal to the Great Lakes, to tidewater, and to New England and of certain other major currents of distribution have been included in earlier reports of this series (see Coal in 1928, pp. 512–527) but are this year reserved for a special analysis of distribution in 1929. A copy of the distribution report may be had upon application to the Bureau of Mines. Tables 69 and 70 record two features of the distribution of bituminous coal that bear closely on the statistics of production.

MINE FUEL, LOCAL SALES, COAL COKED AT MINES, AND SHIPMENTS

The primary distribution classification is that used throughout the basic tables of this report: "Used at mines for power and heat," "Sold to local trade and used by employees," "Made into coke at mines," and "Loaded at mines for shipment." The proportion disposed of under these several classifications varies greatly from district to district, and it also tends to change with the years. (See fig. 47 and Table 69.) The proportion used as fuel by the mines has been declining because of the growing practice of buying power to operate the collieries from central electric stations. The proportion made into coke at the mines has also been declining because of the steady replacement of beehive with by-product coke. The proportion sold locally, without shipment, on the other hand, has been increasing in recent years. In 1930, the local sales amounted to 22,121,055 tons, or 4.7 per cent of the total. This quantity includes coal furnished to colliery employees, often at nominal prices; coal delivered direct to tenders of steam locomotives at the tipple (a very considerable item in some districts); sales by truck and wagon in near-by towns; and sales to electric-power stations or industries, such as brick and tile works, adjacent to the mines.

The net result of the several shifts in disposal has been to increase the proportion of the total output loaded at the mines for shipment. From 78.5 per cent of the total in 1890, the shipments have risen to 93.6 per cent in 1930. Corresponding data for anthracite will be found in Table 18A (p. 757).

TABLE 69.—*Shift in disposal of total output of bituminous coal, 1890–1930*

Year	Per cent of total—				Year	Per cent of total—			
	Loaded at mines for shipment	Made into coke at mines	Sold to local trade and used by employees	Used at mines for power and heat		Loaded at mines for shipment	Made into coke at mines	Sold to local trade and used by employees	Used at mines for power and heat
1890	78.5	13.8	6.3	1.4	1921	91.8	2.1	3.9	2.2
1895	78.7	13.6	6.2	1.5	1922	90.9	3.1	4.1	1.9
1900	81.5	13.0	3.7	1.8	1923	89.6	4.9	3.9	1.6
1905	80.9	13.5	3.4	2.2	1924	91.3	3.0	4.3	1.4
1910	82.2	12.5	3.0	2.3	1925	91.8	3.0	4.1	1.1
1915	85.8	9.2	2.8	2.2	1926	91.8	3.1	4.1	1.0
1916	84.3	10.4	3.2	2.1	1927	92.7	2.1	4.2	1.0
1917	85.2	9.1	3.5	2.2	1928	93.3	1.4	4.4	.9
1918	86.8	7.8	3.2	2.2	1929	93.1	1.7	4.3	.9
1919	87.8	5.9	3.9	2.4	1930	93.6	.9	4.7	.8
1920	88.8	5.4	3.7	2.1					

BITUMINOUS COAL LOADED FOR SHIPMENT BY INDIVIDUAL RAILROADS AND WATERWAYS, AS REPORTED BY OPERATORS

The sum of the coal charged into coke ovens at the mines, the local sales, and the mine fuel in 1930 was 30,127,730 tons out of a total production of 467,526,299 tons. The remainder, 437,398,569 tons, was loaded at the mines for shipment, and of this 21,172,603 tons was loaded into barges and other river vessels and 416,225,966 tons was loaded into railroad cars. Table 70 shows the quantity so originated on each railroad and waterway, as reported by mine operators in answer to the following question:

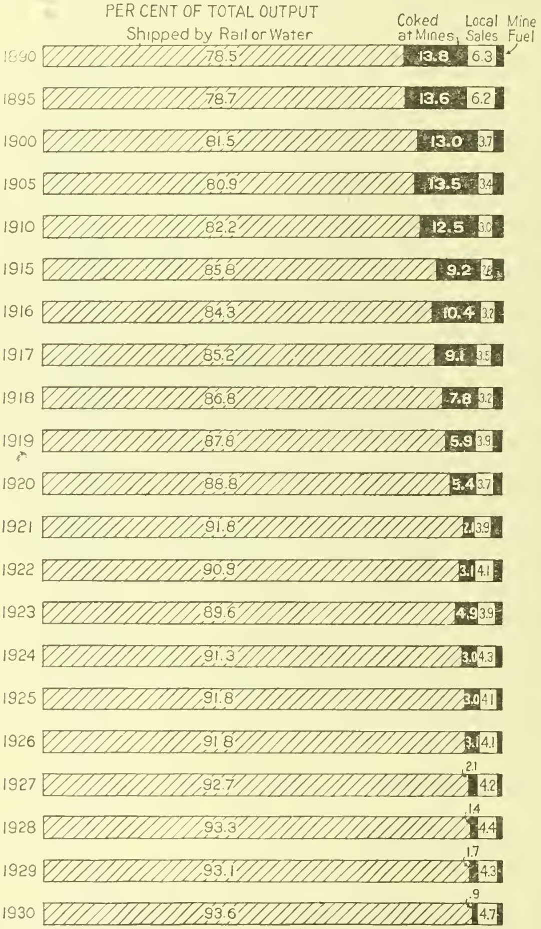

FIGURE 47.—Shifts in disposition of total output of bituminous coal, 1890–1930

Railroads or waterways on which product was first loaded for shipment:
Name of road or waterway --
(Give shipments over each road separately) Tons
-- ------
-- ------
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As these statistics include nonrevenue railroad fuel they may differ from those compiled by the railroad companies, which often show only revenue freight and include coal received from connecting lines or coal shipped off the Lake docks as well as that originating at mines on the lines reporting.

Where the road serving the district is a subsidiary of a larger road some operators may report their coal as loaded on the subsidiary and others as loaded on the parent system, although a few subsidiaries have been consolidated under the name of the parent road. For instance, the shipments over the Vandalia, the Pittsburgh, Cincinnati, Chicago & St. Louis, the Pennsylvania Co., the Ohio River & Western, and the Wheeling Terminal have been included under the Pennsylvania System. In general, the figures here shown are given under the name reported by the operator; and the bureau does not attempt to combine them under the name of the larger system, believing such combination can best be made by those using the figures, as they are probably familiar with coal-traffic problems. To approximate the total for the Southern System, for example, the reader should add to the total shown for the Southern Railway the figures of the Alabama Great Southern, Northern Alabama, Cincinnati, New Orleans & Texas Pacific, and Harriman & Northeastern lines. If such combination is made, the total will usually be found to check reasonably with the statistics issued by such railroads as keep records of total coal originated.

The figures for the Chicago & Eastern Illinois Railroad include coal loaded in cars of the Elgin, Joliet & Eastern and moved by the latter road over the rails of the Chicago & Eastern Illinois under a trackage agreement.

The Zanesville & Western is shown separately when so reported, rather than in combination with the New York Central, although it is apparent that many operators served by this road have reported the name of the parent road.

The quantities shown in the following table as shipped by waterways do not all agree with statistics on river traffic published by the United States Engineer Office. The shipments of coal on Monongahela River, according to the United States Engineer Office at Pittsburgh, amounted to 20,637,000 tons in 1930. The differences between these records and the reports of the operators to the Bureau of Mines are due to various causes, in part to the fact that shipments of coal loaded in cars at the mines and later transferred to boats would be classified by the bureau as "rail" and by the engineer office as "river."

TABLE 70.—*Bituminous coal loaded for shipment by individual railroads and waterways, as reported by operators, in 1930, in net tons*

Route	State	Quantity	
		By State	Total for route
RAILROADS			
Alabama Central	Alabama	74,750	74,750
Alabama Great Southern	do	128,178	128,178
Alaska	Alaska	112,900	112,900
Artemus Jellico	Kentucky	152,968	152,968
Atchison, Topeka & Santa Fe	Colorado	548,312	3,044,093
	Illinois	352,016	
	Kansas	256,334	
	Missouri	412,104	
	New Mexico	1,447,546	
	Oklahoma	27,781	
Baltimore & Ohio	Illinois	466,246	32,023,645
	Indiana	395,836	
	Maryland	42,418	
	Ohio	4,508,386	
	Pennsylvania	9,133,513	
	West Virginia	17,477,246	
Bessemer & Lake Erie	Pennsylvania	2,467,360	2,467,360
Bevier & Southern	Missouri	108,300	108,300
Buffalo & Susquehanna	Pennsylvania	1,078,499	1,078,499
Buffalo Creek & Gauley	West Virginia	535,604	535,604
Buffalo, Rochester & Pittsburgh	Pennsylvania	6,090,460	6,090,460
Cambria & Indiana	do	3,410,490	3,410,490
Campbell's Creek	West Virginia	913,815	913,815
Carbon County	Utah	409,143	409,143
Caseyville	Illinois	68,202	68,202
Central of Georgia	Alabama	887,173	894,206
	Georgia	7,033	
Chaffee	Maryland	119,172	119,172
Chesapeake & Ohio	Kentucky	9,057,824	52,467,979
	Ohio	1,538,056	
	West Virginia	41,872,099	
Cheswick & Harmar	Pennsylvania	638,808	638,808
Chicago & Alton	Illinois	1,823,541	1,880,101
	Missouri	56,560	
Chicago & Eastern Illinois	Illinois	2,696,588	4,912,133
	Indiana	2,215,545	
Chicago & Illinois Midland	Illinois	3,101,884	3,101,884
Chicago & North Western	do	2,968,696	3,203,830
	Iowa	194,168	
	Wyoming	40,966	
Chicago, Burlington & Quincy	Colorado	365,402	11,585,930
	Illinois	9,750,520	
	Iowa	303,926	
	Missouri	70,019	
	Wyoming	1,096,063	
Chicago Great Western	Iowa	95,795	95,795
Chicago, Indianapolis & Louisville	Indiana	1,305,199	1,305,199
Chicago, Milwaukee, St. Paul & Pacific	Illinois	184	6,488,559
	Indiana	4,671,438	
	Iowa	754,684	
	Missouri	72,887	
	Montana	878,804	
	North Dakota	53,354	
	South Dakota	1,330	
	Washington	55,878	
Chicago, Rock Island & Pacific	Colorado	2,155	2,313,686
	Illinois	309,838	
	Iowa	991,321	
	Missouri	20,015	
	Oklahoma	948,064	
	Texas	42,293	
Chicago, Springfield & St. Louis	Illinois	666,063	666,063
Cincinnati, New Orleans & Texas Pacific	Tennessee	20,842	20,842
Cleveland, Cincinnati, Chicago & St. Louis	Illinois	4,853,815	6,442,223
	Indiana	1,588,408	
Clinchfield	Kentucky	52,545	2,011,056
	Virginia	1,958,511	
Colorado & Southeastern	Colorado	324,913	324,913
Colorado & Southern	do	1,208,214	1,208,214
Colorado & Wyoming	do	383,876	383,876
Conemaugh & Black Lick	Pennsylvania	9,409	9,409
Crystal River & San Juan	Colorado	13,956	13,956
Cumberland & Pennsylvania	Maryland	1,045,045	1,045,045
Dardanelle & Russellville	Arkansas	78,123	78,123
Dents Run	Pennsylvania	43,475	43,475
Denver & Intermountain	Colorado	99,169	99,169

TABLE 70.—*Bituminous coal loaded for shipment by individual railroads and waterways, as reported by operators, in 1930, in net tons*—Continued

Route	State	Quantity	
		By State	Total for route
RAILROADS—continued			
Denver & Rio Grande Western	Colorado	1,807,652	3,903,556
	New Mexico	20,261	
	Utah	2,075,643	
Denver & Salt Lake	Colorado	791,610	791,610
Des Moines & Central Iowa	Iowa	168,412	168,412
Detroit, Toledo & Ironton	Ohio	8,534	8,534
East Broad Top Railroad & Coal Co	Pennsylvania	487,766	487,766
Eastern Railway & Lumber Co	Washington	8,856	8,856
Erie	Ohio	24,702	996,840
	Pennsylvania	972,138	
Evansville & Ohio Valley	Indiana	55,097	55,097
Evansville, Indianapolis & Terre Haute	do	1,277,847	1,277,847
Evansville, Suburban & Newburgh	do	67,301	67,301
Fort Dodge, Des Moines & Southern	Iowa	4,454	4,454
Fort Smith & Western	Oklahoma	107,150	107,150
Fort Smith, Subiaco & Rock Island	Arkansas	4,661	4,661
Great Northern	Montana	297,260	772,772
	North Dakota	272,709	
	Washington	202,803	
Harriman & Northeastern	Tennessee	289,213	289,213
Houston Texas Central	Texas	15,767	15,767
Huntingdon & Broad Top Mountain Railroad & Coal Co	Pennsylvania	379,791	379,791
Illinois Central	Alabama	265,977	16,493,765
	Illinois	8,968,723	
	Indiana	230,481	
	Kentucky	7,028,584	
Illinois Terminal	Illinois	703,568	703,568
Indian Creek Valley	Pennsylvania	106,720	106,720
International-Great Northern	Texas	64,427	64,427
Interstate	Kentucky	303,113	2,496,213
	Virginia	2,193,100	
Iowa Southern Utilities Co	Iowa	179,883	179,883
Johnstown & Stony Creek	Pennsylvania	650	650
Joplin & Pittsburg	Kansas	241,559	241,559
Kanawha Central	West Virginia	233,256	233,256
Kanawha, Glen Jean & Eastern	do	1,136,491	1,136,491
Kansas City, Clay County & St. Joseph	Missouri	7,280	7,280
Kansas City Southern	Arkansas	14,000	647,877
	Kansas	98,668	
	Missouri	487,023	
	Oklahoma	48,186	
Kansas, Oklahoma & Gulf	do	126,977	126,977
Kelley's Creek & Northwestern	West Virginia	1,176,961	1,176,961
Kentucky & Tennessee	Kentucky	760,468	760,468
Lake Erie, Franklin & Clarion	Pennsylvania	129,487	129,487
Laramie, North Park & Western	Colorado	40,970	40,970
Ligonier Valley	Pennsylvania	279,772	279,772
Litchfield & Madison	Illinois	486,870	486,870
Louisville & Nashville	Alabama	3,432,197	31,611,865
	Illinois	115,245	
	Kentucky	27,006,990	
	Tennessee	808,015	
	Virginia	249,418	
Mary Lee	Alabama	829,855	829,855
Michigan Central	Michigan	401,664	401,664
Midland Valley	Arkansas	204,130	571,800
	Oklahoma	367,670	
Minneapolis & St. Louis	Illinois	383,439	431,439
	Iowa	48,000	
Minneapolis, St. Paul & Sault Ste. Marie	North Dakota	476,714	476,714
Missouri-Illinois	Illinois	203,818	203,818
Missouri-Kansas-Texas	Kansas	207,443	687,192
	Missouri	30,091	
	Oklahoma	352,255	
	Texas	97,403	
Missouri Pacific	Arkansas	927,711	8,014,339
	Illinois	5,202,561	
	Kansas	722,977	
	Missouri	1,151,582	
	Texas	9,508	
Mobile & Ohio	Alabama	477,332	708,369
	Illinois	231,037	
Monongahela	Pennsylvania	6,794,585	13,768,720
	West Virginia	6,974,135	
Montana	Arkansas	75,762	75,762
Montana, Wyoming & Southern	Montana	418,613	418,613
Montour	Pennsylvania	6,630,543	6,630,543
Nashville, Chattanooga & St. Louis	Tennessee	1,019,777	1,019,777
New Haven & Dunbar	Pennsylvania	1,106	1,106

TABLE 70.—*Bituminous coal loaded for shipment by individual railroads and waterways, as reported by operators, in 1930, in net tons*—Continued

Route	State	Quantity	
		By State	Total for route
RAILROADS—continued			
New Mexico Midland	New Mexico	7,080	7,080
New York Central (includes some coal shipped over subsidiary roads: Kanawha and Michigan, Toledo & Ohio Central, and Zanesville & Western)	Ohio	5,030,154	10,656,203
	Pennsylvania	4,301,361	
	West Virginia	1,324,688	
New York, Chicago & St. Louis	Illinois	487,158	487,158
Norfolk & Western	Kentucky	4,675,633	37,814,510
	Virginia	3,476,699	
	West Virginia	29,662,178	
Norfolk Southern	North Carolina	24,464	24,464
Northern Alabama	Alabama	638,577	638,577
Northern Pacific	Montana	1,232,701	3,081,566
	North Dakota	533,106	
	Washington	1,315,759	
Ohio & Kentucky	Kentucky	47,513	47,513
Ohio River Electric	Ohio	766	766
Oklahoma City-Ada-Atoka	Oklahoma	93,672	93,672
Oneida & Western	Tennessee	1,200	1,200
Oregon Short Line	Wyoming	687,268	687,268
Oregon-Washington Railroad & Navigation Co	Washington	181,082	181,082
Pacific Coast	do	322,194	322,194
Pennsylvania (includes Pittsburgh, Cincinnati, Chicago & St. Louis)	Illinois	537,125	48,124,490
	Indiana	1,723,034	
	Ohio	5,198,833	
	Pennsylvania	39,157,570	
	West Virginia	1,507,928	
Peoria & Eastern	Illinois	241,972	241,972
Peoria & Pekin Union	do	235,635	235,635
Peoria, Hanna City & Western	do	585,938	585,938
Pere Marquette	Michigan	207,531	207,531
Peru, La Salle & Deer Park	Illinois	58,613	58,613
Pittsburg & Shawmut	Pennsylvania	1,511,046	1,511,046
Pittsburg County	Oklahoma	2,900	2,900
Pittsburg, Shawmut & Northern	Pennsylvania	635,149	635,149
Pittsburgh & Lake Erie	do	5,249,779	5,249,779
Pittsburgh & Susquehanna	do	15,677	15,677
Pittsburgh & West Virginia (includes West Side Belt)	Ohio	98,291	3,057,167
	Pennsylvania	2,891,075	
	West Virginia	67,801	
Pittsburgh, Chartiers & Youghiogheny	Pennsylvania	4,302	4,302
Pittsburgh, Lisbon & Western	do	17,847	17,847
Preston	West Virginia	247,171	247,171
Quincy, Omaha & Kansas City	Missouri	77,100	77,100
Rio Grande & Eagle Pass	Texas	15,262	15,262
Rio Grande Eastern	New Mexico	4,246	4,246
Rio Grande Southern	Colorado	19,598	19,598
Rockdale, Sandow & Southern	Texas	123,400	123,400
St. Louis & Belleville Electric	Illinois	12,654	12,654
St. Louis & Hannibal	Missouri	20,305	20,305
St. Louis & O'Fallon	Illinois	275,261	275,261
St. Louis & Ohio River	do	332,151	332,151
St. Louis-San Francisco	Alabama	2,082,513	4,123,785
	Arkansas	209,187	
	Kansas	562,025	
	Missouri	653,311	
	Oklahoma	616,749	
St. Louis Southwestern of Texas	Texas	353,952	353,952
St. Louis, Troy & Eastern	Illinois	141,849	141,849
Santa Fe Northwestern	New Mexico	3,915	3,915
Scott's Run	West Virginia	615,228	615,228
Seaboard Air Line	Alabama	1,200	1,200
Southern	do	2,314,630	8,822,158
	Illinois	313,314	
	Indiana	1,705,579	
	Kentucky	583,405	
	Tennessee	1,476,971	
	Virginia	2,428,259	
Southern Illinois Railway & Power Co	Illinois	32,764	32,764
Southern Pacific	California	10,000	401,300
	New Mexico	367,000	
	Oregon	2,300	
	Texas	22,000	
Springfield Terminal	Illinois	75,767	75,767
Susquehanna & New York	Pennsylvania	26,703	26,703
Tennessee	Tennessee	594,875	594,875
Tennessee Central	do	681,608	681,608
Tennessee Coal, Iron & Railroad Co	Alabama	2,495,089	2,495,089
Texas & Pacific	Texas	22,274	22,274
Texas Short Line	do	39,831	39,831

TABLE 70.—*Bituminous coal loaded for shipment by individual railroads and waterways, as reported by operators, in 1930, in net tons*—Continued

Route	State	Quantity	
		By State	Total for route
RAILROADS—continued			
Thomas & Sayreton	Alabama	617,833	617,833
Toledo & Ohio Central	Ohio	(1)	(1)
Toledo, Peoria & Western	Illinois	18,862	18,862
Toronto, Knoxville & Western	Ohio	96,055	96,055
Twin City Electric	Washington	2,443	2,443
Uintah	Colorado	8,046	8,046
Union	Pennsylvania	18,774	18,774
Union Pacific	Colorado	1,390,637	5,407,807
	Kansas	20,145	
	Utah	42,194	
	Wyoming	3,954,831	
Unity	Pennsylvania	817,819	817,819
Utah	Utah	1,658,275	1,658,275
Virginian	Virginia	108,397	10,146,248
	West Virginia	10,037,851	
Wabash	Illinois	2,220,362	2,500,157
	Iowa	192,875	
	Missouri	86,920	
Washington Run	Pennsylvania	146,063	146,063
Western Allegheny	do	228,544	228,544
Western Maryland	Maryland	941,410	4,176,385
	Pennsylvania	373,090	
	West Virginia	2,861,885	
West Side Belt	Pennsylvania	(1)	(1)
West Virginia Northern	West Virginia	150,816	150,816
Wheeling & Lake Erie	Ohio	3,249,211	3,249,211
Winfield	Pennsylvania	15,286	15,286
Woodward Iron Co	Alabama	785,698	785,698
Youngstown & Ohio River	Ohio	2,356	2,356
Zanesville & Western (see also New York Central)	do	152,093	152,093
Total railroad shipments		416,225,966	416,225,966
WATERWAYS			
Allegheny River	Pennsylvania	797,657	797,657
Black Warrior River	Alabama	98,161	98,161
Green River	Kentucky	67,419	67,419
Kanawha River	West Virginia	429,132	429,132
Monongahela River	Pennsylvania	19,022,849	19,022,849
Muskingum River	Ohio	217,657	217,657
Ohio River	Kentucky	272,315	536,646
	Ohio	7,843	
	West Virginia	256,488	
Tradewater River	Kentucky	3,082	3,082
Total waterway shipments		21,172,603	21,172,603
Grand total, loaded at mines for shipment by railroads and waterways.		437,398,569	437,398,569
Sold to local trade and used by employees		22,121,055	22,121,055
Used at mines for power and heat		3,992,760	3,992,760
Made into coke at mines		4,013,915	4,013,915
Total production		467,526,299	467,526,299

[1] Included under New York Central.

IMPORTS AND EXPORTS[14]

IMPORTS

The exigencies of supply and trade make the United States both an importer and exporter of coal. Although this country has a large exportable surplus, there are certain districts that depend on foreign coal for their requirements.

Imports of bituminous coal consist chiefly of coal from Vancouver Island and the Crow's Nest Pass field in British Columbia, received in Washington, Montana, and Idaho. There is also a small movement of coal from Nova Scotia into New England. For the five years following the war, imports of soft coal averaged considerably more than 1,000,000 tons a year, but for the period 1924 to 1930 they averaged only slightly more than 500,000 tons a year. In 1930 imports fell still lower and a total of only 240,886 tons was reported. Compared with the imports of the previous year, this is a decrease of 51.4 per cent. (See Table 71.)

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[14] Tables of imports and exports compiled by J. A. Dorsey, of the Bureau of Mines, from the records of the Bureau of Foreign and Domestic Commerce.

Anthracite imports, on the other hand, have increased sharply in recent years. In 1930 imports of hard coal amounted to 674,812 tons, an increase of 38.5 per cent over the previous year. With the exception of 1926, when the domestic supply was cut off on account of the strike, this is the largest tonnage of foreign anthracite ever received in this country. Practically all of the anthracite imported is consumed in the coast cities of New England, chiefly in Boston and Providence. (See Table 72.)

The bulk of the foreign anthracite during the past two years has come from the United Kingdom and Russia, these two countries accounting for 96.8 per cent of the total in 1930. Of particular interest is the rapid increase in imports from Soviet Russia, which in 1930 amounted to 193,131 tons, an increase of 52.4 per cent over 1929. Prior to 1929 there were no imports of anthracite from Russia.

TABLE 71.—*Bituminous coal imported, by countries and districts, 1926–1930, in net tons*

[Compiled from the records of the Bureau of Foreign and Domestic Commerce]

Country and district	1926	1927	1928	1929	1930
COUNTRY OF ORIGIN					
North America:					
Canada	407,464	497,717	462,827	455,738	237,086
Mexico	250	212	320	5,719	500
Newfoundland and Labrador	5				
Salvador	1,120				
West Indies—					
British—					
Jamaica		112			
Other		168			
Cuba	37				
South America:					
Brazil			67	116	
Peru		1			
Venezuela	1				
Europe:					
Belgium	140	280	118		
France	2				
Germany	632		5,716	2	673
Italy		168			
Netherlands	280	325	280		
Poland and Danzig			3,462		
Soviet Russia			1		71
United Kingdom	38,330	30,407	53,418	20,617	310
Asia:					
China	10		1		
French Indo-China					2,240
Japan	32,454	15,920	17,115	8,147	6
Africa:					
Algeria and Tunisia			791		
Canary Islands		56			
Oceania:					
Australia	4,941	4,477	2,410	4,880	
	485,666	549,843	546,526	495,219	240,886
DISTRICT OF ENTRY					
Alaska	30,581	30,481	32,518	27,072	23,892
Arizona	26				
Buffalo		113		330	
Chicago	356			3	1
Dakota	10,483	9,741	11,212	11,238	8,210
Duluth-Superior	473	980	454	533	312
Florida	37				
Galveston	1,260	885	896		

TABLE 71.—*Bituminous coal imported, by countries and districts, 1926–1930, in net tons*—Continued

Country and district	1926	1927	1928	1929	1930
DISTRICT OF ENTRY—continued					
Hawaii	37,104	20,256	24,747	25,385	-----
Los Angeles	632	-----	-----	113	-----
Maine and New Hampshire	50,533	49,344	56,477	40,710	29,240
Maryland	280	-----	3,462	1,120	-----
Massachusetts	1,840	34	20,380	5,229	71
Michigan	437	47	440	-----	400
Minnesota	-----	-----	-----	18	-----
Montana-Idaho	253,894	330,788	307,629	298,473	126,671
New Orleans	-----	336	-----	157	-----
New York	230	4,502	4,948	3,986	555
Oregon	10	235	403	790	6
Philadelphia	675	-----	6	-----	6
Pittsburgh	-----	-----	1	-----	-----
Porto Rico	-----	280	-----	-----	-----
Rhode Island	7,155	-----	-----	-----	-----
St. Lawrence	3,017	4,195	405	-----	3
San Antonio	224	213	320	5,719	500
San Francisco	1,570	-----	5,784	63	560
South Carolina	-----	280	112	-----	-----
Vermont	119	348	31	-----	1
Washington	84,730	96,785	76,301	74,280	50,458
	485,666	549,843	546,526	495,219	240,886

TABLE 72.—*Anthracite imported, by countries and districts, 1926–1930, in net tons*

[Compiled from the records of the Bureau of Foreign and Domestic Commerce]

Country and district	1926	1927	1928	1929	1930
COUNTRY OF ORIGIN					
Australia	-----	-----	325	-----	-----
Belgium	27,910	-----	-----	-----	4
Brazil	2	-----	-----	-----	-----
British West Indies (other)	-----	-----	-----	-----	-----
Canada	9,696	3,391	4,620	3,745	6,450
China	-----	-----	-----	-----	-----
Cuba	-----	-----	-----	-----	-----
France	2,779	-----	-----	11	1
Germany	198,011	2	13,223	3,089	15,010
Hong Kong	-----	-----	-----	-----	4
Hungary	-----	-----	-----	-----	3
Japan	(1)	2,778	7,838	-----	-----
Netherlands	53,730	3,030	5,471	-----	-----
Peru	-----	-----	3	-----	-----
Soviet Russia in Europe	-----	-----	-----	126,751	193,131
United Kingdom	521,827	109,829	353,227	353,576	460,209
Venezuela	1	-----	-----	-----	-----
Virgin Islands of the United States	-----	-----	-----	-----	-----
	813,956	119,030	384,707	487,172	674,812
DISTRICT OF ENTRY					
Alaska	3	11	-----	-----	-----
Buffalo	746	1,418	1,177	1,276	1,129
Connecticut	11,985	-----	-----	-----	4,098
Dakota	56	-----	-----	-----	-----
Duluth-Superior	300	141	-----	-----	-----
Florida	-----	-----	-----	-----	-----
Galveston	-----	117	-----	-----	-----
Hawaii	-----	2,778	7,838	-----	162
Los Angeles	-----	-----	30	-----	-----
Maine and New Hampshire	135,408	24,014	17,542	46,493	141,263
Maryland	3,743	-----	2,740	-----	-----
Massachusetts	210,918	63,137	307,796	321,413	416,386
Michigan	-----	170	-----	57	-----
Montana-Idaho	-----	-----	-----	-----	50
New York	393,930	4,490	1,516	16	14,888
Ohio	1	-----	-----	-----	-----
Oregon	-----	-----	-----	-----	4
Philadelphia	27,375	-----	-----	-----	-----
Porto Rico	-----	-----	-----	-----	-----
Rhode Island	29,056	18,865	43,699	115,463	96,713
St. Lawrence	178	112	337	6	21
San Francisco	9	2	526	2,406	4
Vermont	92	143	-----	42	36
Washington	156	3,632	1,506	-----	58
	813,956	119,030	384,707	487,172	674,812

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[1] Less than 1 ton.

EXPORTS

In the work of the United States Department of Commerce responsibility for the promotion of foreign trade in coal is vested in the Bureau of Foreign and Domestic Commerce, which maintains a special coal section for the purpose. Information on the demand for coal in foreign countries and on the export market will be found in the current reports and bulletins issued by that bureau.

The field of the coal division of the Bureau of Mines is primarily the internal coal trade of the country. In this report, therefore, the discussion of exports is limited to presenting as much of a statistical background as is necessary for understanding the domestic market. In normal times the export trade absorbs only 3 or 4 per cent of the national output; but in certain fields it is an important element in the demand, and at times—as for example in 1926—extraordinary developments in the export trade have furnished the clue to unexpected behavior of the internal markets of the country.

In considering exports of bituminous coal, it is well to distinguish between the movement to Canada; the sea-borne exports to near-by destinations, especially in the Caribbean; and the shipments to what may be called "overseas" destinations, lying at greater distances from our shores. The following statistical grouping of destinations has been recommended by the Coal Exporters' Association of the United States as the most appropriate for discussing the American export trade:

(1) Canada and Mexico.

(2) Caribbean region; that is the West Indies and Central America, including the Bahamas, the Virgin Islands, and Panama.

(3) "Overseas" destinations, including Bermuda, Newfoundland, Miquelon-St. Pierre, and all countries in South America, Europe, Africa, Asia, and Oceania.

Figure 48 and Table 73 show the exports, subdivided in this way, over the last 20 years, a period long enough to indicate the trend.

TRADE WITH CANADA

Canada has always been the principal foreign customer for United States coal. Although Canada possesses resources of coal and lignite of vast extent, the deposits are located chiefly in the western plains or the coastal regions, while the densely populated and industrialized sections of central Canada are devoid of coal resources. As a result, a large part of the coal requirements of this area is imported from the United States. The bulk of the Canadian shipments is transported by all-rail routes, something like three-fifths being handled in this manner. A considerable portion, however, is moved by rail to the lower Lake Erie ports and thence transshipped by water. In addition, a small quantity is transported by the all-water route from the North Atlantic ports via the St. Lawrence to destination. With the exception of Alabama all fields in the Appalachian region participate in the Canadian trade, and there are also occasional shipments from Illinois, Indiana, and western Kentucky; but by far the largest part of the coal entering into the trade originates in Pennsylvania, West Virginia, Ohio, and eastern Kentucky.

In recent years Canadian producers have made strenuous efforts to obtain a larger share of this important market in central Canada, but in spite of this, bituminous coal from the United States has continued to flow in a fairly steady stream. (See fig. 48.) Since 1925 exports of soft coal in Canada have averaged around 14,000,000 tons annually. In 1930 the Canadian trade held up considerably better than the domestic market, declining only 7.1 per cent below the level of the previous year. The total exports for the year amounted to 13,603,118 tons, as against 14,645,001 tons in 1929.

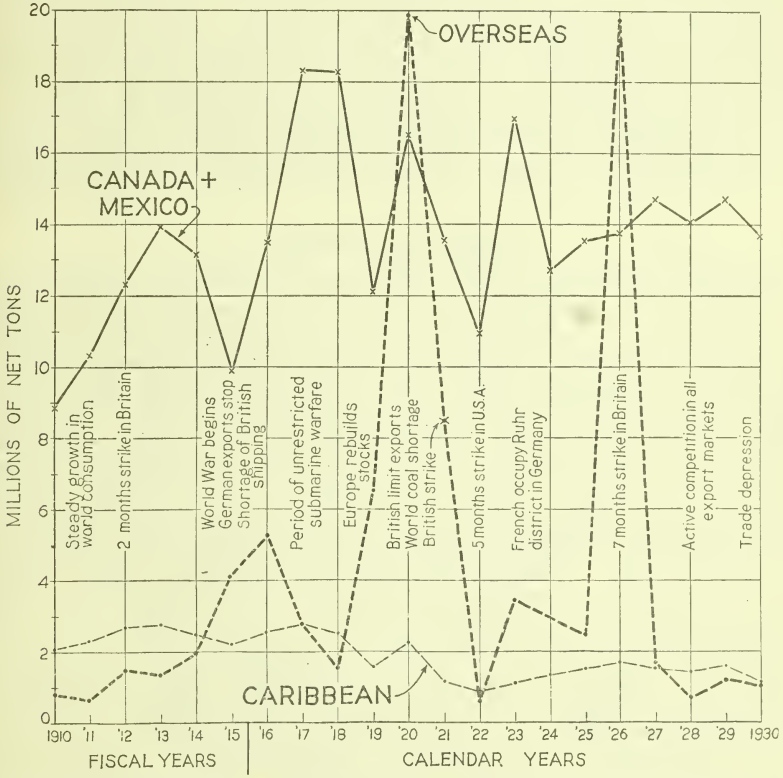

FIGURE 48.—Twenty years' exports of bituminous coal to (1) Canada and Mexico, (2) the Caribbean, and (3) "overseas" destinations. Exports to Canada (including also the small shipments to Mexico) have been relatively stable, except for the changes in general business conditions, and run closely parallel to the domestic demand within the United States. Exports to the Caribbean region and other destinations adjacent to North America are also comparatively stable, because American shippers have a decided advantage in these markets. Exports overseas have been small except when competition of British or German coal was shut off. In 1920 and 1926 "overseas" exports increased so as to be a dominant influence on prices in the internal markets of the country

In contrast with the bituminous trade exports of anthracite to Canada have fallen off sharply in recent years. From an average of 4,200,000 tons for the period 1920–1924, anthracite shipments declined to an average of 3,400,000 tons for the period 1925–1929, a decrease of 19 per cent. In 1930 the anthracite tonnage declined to still lower levels, amounting to only 2,532,135 tons, a decrease of 25 per cent when compared with the previous year. (See Table 76.) Spirited competition from Welsh anthracite, coke, fuel oil, and domestic bituminous coals largely explains the decline in the use of Pennsylvania anthracite in Canada.

EXPORTS TO THE CARIBBEAN

In the Caribbean trade American exporters have an advantage in distance over the British and German companies, who are their major competitors in the world's ocean-borne trade. For this reason most of the coal requirements of this region are normally supplied from the United States. The record of shipments to the Carribean group is represented by the light dashed line in Figure 48. Like the Canadian movement it is comparatively stable and lacks the violent fluctuations that characterize the exports to more distant countries. Over the 20-year period the export trade with this region has been gradually diminishing largely because of the competition of fuel oil.

In 1930 shipments to this group of countries amounted to 1,180,000 tons, a decrease of 21.3 per cent when compared with the shipments of 1,500,000 tons in 1929.

OVERSEAS EXPORTS

In sharp contrast to the comparatively stable movements to Canada and the Caribbean the exports overseas have been subject to violent and unpredictable fluctuations. In view of recent efforts to stimulate the export trade the record of this overseas movement has been of especial interest. The total is shown by the curve in Figure 48, and details by continents are given in Table 73. The record proves clearly that except when the normal competition of British and German coal has been shut off the overseas movement of American coal has been small. Before the World War the overseas exports ran about a million tons a year. In the fiscal year 1912, when partly stimulated by a 2-month stoppage in Great Britain, they amounted to 1,472,000 tons. A fairer measure of the pre-war movement was the fiscal year 1913 when, with Great Britain and Germany both competing actively, the overseas shipments were 1,389,000 tons. The immediate effect of the World War was to stimulate the movement overseas by cutting off exports from Germany and by interfering with British shipping. The ultimate effect was to curtail exports, as the submarine warfare cut more and more deeply into the world's supply of shipping. By the close of the war stocks in Europe had been reduced to the vanishing point, and in 1919 substantial purchases were made to rebuild the depleted reserves. In the meantime, many of the French mines had been destroyed in the war and some years would be required to restore them. District strikes in Britain during July and August further reinforced the demand for American coal, and the total shipments overseas in 1919 rose to 6,538,000 tons. The following year a panic swept the world's coal trade. A decision of the British Government to limit exports in view of a shortage at home and a sudden increase in world demand started a speculative boom in exports from the United States. The boom came at a time when American stocks were dangerously low and when an outlaw strike of the railway switchmen had created an acute shortage of cars. Spot prices at the seaboard rose as high as $25 a ton; and the fever was transmitted to the internal markets, even to those beyond the Mississippi. The tonnage shipped overseas in 1920 climbed to a peak of 19,939,000 tons. The year 1921 was one of industrial depression, but a hangover of the extraordinary demand of the year before and a 3-month strike of the British miners sustained the overseas demand. From the heights of 1920–21 exports plunged to barely 600,000 tons, as the great strike of the American miners in 1922 dealt the overseas movement a staggering blow. In 1923, however, American exporters received a windfall of unexpected business through the French occupation of the Ruhr, the effects of which were felt well into the following year. In 1926 a tremendous strike occurred in Britain, during which most of the miners in the United Kingdom were idle for seven months, and the vacuum created caused our shipments overseas to shoot up to another peak like that of 1920. Spot prices advanced sharply, although much less than in 1920, and once again the export demand set the tone of the internal markets of the country. The total shipped overseas in 1926 was 19,803,000 tons, of which 15,805,000 went to Europe alone So great was the shortage created by the strike that it carried over into the early weeks of 1927.

This series of accidents in the ocean-borne coal trade at length came to an end. In 1928 American exporters were exposed to the full pressure of European competition, and the shipments overseas fell to 681,000 tons. They increased to 1,202,000 tons in 1929, but declined to 1,030,000 tons in 1930.

Ten years of postwar experience have thus shown that labor disputes on one side of the Atlantic or the other are the chief cause of the speculative uncertainties of the ocean-borne trade, and that except during shortages in Europe the overseas demand for American coal has been small.

TABLE 73.—*Exports of bituminous coal to (1) Canada and Mexico, (2) the West Indies and Central America, and (3) "overseas" destinations, 1910–1930*

[Figures represent thousands of net tons]

Year	(1) Canada and Mexico	(2) West Indies and Central America [1]	(3) "Overseas" (all other countries)							Grand total
			Newfoundland, Miquelon, and Bermuda	South America	Europe	Asia	Africa	Oceania	Total "overseas"	
Fiscal year:										
1910	8,846	1,999	24	197	390	17	3	187	818	11,663
1911	10,357	2,266	22	205	284	6	66	54	637	13,260
1912	12,338	2,665	22	650	454	8	338	--------	1,472	16,475
1913	13,918	2,706	40	494	533	--------	263	59	1,389	18,013
1914	13,181	2,392	38	647	1,034	--------	246	52	2,017	17,590
1915	9,876	2,145	27	1,453	2,308	19	274	41	4,122	16,143
1916	11,984	2,602	46	2,061	4,025	18	264	--------	6,414	21,000
Calendar years:										
1916	13,481	2,473	53	2,476	2,529	18	225	--------	5,301	21,255
1917	18,327	2,748	49	1,606	997	--------	113	--------	2,765	23,840
1918	18,316	2,477	25	1,465	49	--------	19	--------	1,558	22,351
1919	12,063	1,513	27	1,666	4,585	15	189	56	6,538	20,114
1920	16,458	2,120	83	3,948	14,741	32	1,095	40	19,939	38,517
1921	13,589	1,095	42	1,759	5,515	49	1,005	77	8,447	23,131
1922	10,937	852	18	344	171	--------	91	--------	624	12,413
1923	16,960	1,021	64	585	2,678	3	122	21	3,473	21,454
1924	12,746	1,282	125	1,252	1,520	17	146	12	3,072	17,100
1925	13,548	1,513	135	917	1,161	8	177	3	2,401	17,462
1926	13,763	1,706	122	2,730	15,805	30	1,107	9	19,803	35,272
1927	14,723	1,543	102	741	793	22	88	--------	1,746	18,012
1928	14,049	1,434	99	273	255	1	53	--------	681	16,164
1929	14,727	1,500	211	332	567	8	84	--------	1,202	17,429
1930	13,667	1,180	95	353	469	14	97	2	1,030	15,877

[1] Includes Bahamas, Virgin Islands, and Panama.

TABLE 74.—*Bituminous coal exported, by countries, 1926–1930, in net tons* [1]

[Compiled from the records of the Bureau of Foreign and Domestic Commerce]

Country	1926	1927	1928	1929	1930
North America:					
Bermudas	23, 122	18, 031	11, 554	15, 149	10, 465
British Honduras	562	419	510	109	347
Canada	13, 633, 513	14, 594, 297	13, 958, 961	14, 645, 001	13, 603, 118
Central America—					
Costa Rica	5, 657	5, 788	221	2, 494	1, 136
Guatemala	430	716	755	899	561
Honduras	1, 302	988	1, 352	1, 303	971
Nicaragua	5, 126	602	6, 171	410	242
Panama	445, 305	398, 930	296, 067	340, 879	224, 462
Salvador	128	157	134	66	39
Mexico	128, 633	129, 248	91, 319	82, 480	63, 953
Miquelon and St. Pierre Islands	14, 885	16, 016	3, 735	30, 314	12, 140
Newfoundland and Labrador	83, 545	68, 301	82, 703	166, 028	72, 359
West Indies—					
British—					
Barbados	39, 334	19, 370	32, 638	18, 016	16, 256
Jamaica	159, 533	55, 746	69, 552	75, 991	68, 863
Trinidad and Tobago	59, 353	60, 022	75, 690	86, 188	58, 635
Other British	50, 079	28, 581	22, 942	44, 066	39, 370
Cuba	615, 721	636, 617	599, 600	604, 709	534, 828
Dominican Republic	13, 588	9, 891	1, 192	1, 696	3, 014
French	127, 047	153, 766	154, 012	147, 836	118, 690
Haiti	8, 143	838	187	3	46
Netherlands	81, 189	55, 570	47, 668	32, 390	24, 610
Virgin Islands of the United States	95, 118	113, 614	125, 584	142, 233	87, 665
	15, 591, 313	16, 367, 508	15, 582, 547	16, 438, 260	14, 941, 770
South America:					
Argentina	1, 115, 526	236, 018	36, 165	48, 502	93, 784
Bolivia	14, 112	------------	------------	------------	------------
Brazil	1, 333, 640	419, 709	172, 795	227, 778	208, 060
Chile	3, 405	3, 938	------------	224	------------
Colombia	18, 669	288	323	178	344
Ecuador	9, 088	293	521	38	78
Falkland Islands	11, 862	5, 716	16, 504	------------	------------
Guiana—					
British	21, 703	11, 667	11, 124	10, 133	1, 269
Surinam (Netherland)	5, 645	12, 629	11, 253	6, 774	5, 786
Peru	29, 683	16, 912	4, 530	18, 431	12, 618
Uruguay	145, 601	33, 179	19, 306	19, 072	31, 092
Venezuela	20, 592	551	523	599	24
	2, 729, 526	740, 900	273, 044	331, 729	353, 055
Europe:					
Azores and Madeira Islands	23, 057	------------	------------	------------	------------
Denmark	68, 346	250	------------	------------	------------
France	544, 145	119, 642	23, 113	20, 922	55, 140
Germany	1, 273	130	560	1, 279	------------
Gibraltar	192, 245	14, 324	------------	------------	------------
Greece	28, 925	------------	------------	------------	------------
Iceland and Faroe Islands	4, 716	------------	------------	------------	------------
Irish Free State	769, 849	19, 757	363	------------	------------
Italy	1, 727, 057	359, 654	228, 656	544, 505	414, 023
Latvia	8, 716	------------	------------	------------	------------
Malta, Gozo, etc	30, 903	------------	------------	------------	------------
Netherlands	31, 674	------------	------------	------------	------------
Norway	92, 133	473	------------	------------	214
Poland and Danzig	4, 514	------------	------------	------------	------------
Portugal	163, 372	36, 052	------------	------------	------------
Spain	18, 751	------------	------------	------------	------------
Sweden	5, 027	------------	------------	------------	------------
Turkey in Europe	40, 754	------------	------------	------------	------------
United Kingdom	12, 048, 062	237, 198	2, 274	573	25
Yugoslavia and Albania	1, 724	5, 039	------------	------------	------------
	15, 805, 243	792, 519	254, 966	567, 279	469, 402
Asia:					
Aden	------------	3, 380	22	------------	------------
Arabia	------------	3, 382	------------	------------	------------
British Malaya	------------	3, 525	------------	1, 957	------------
East Indies—					
Netherlands—					
Java and Madura	------------	------------	------------	------------	8, 734
Other	3, 418	------------	------------	------------	5, 159
Japan	194	------------	------------	6, 132	------------
Palestine and Syria	15, 811	------------	------------	------------	------------
Persia	------------	------------	6	------------	------------
Philippine Islands	10, 470	12, 136	1, 120	------------	------------
Soviet Russia in Asia	------------	11	------------	118	7
	29, 893	22, 434	1, 148	8, 207	13, 900

Footnote at end of table.

TABLE 74.—*Bituminous coal exported, by countries, 1926–1930, in net tons*—Con.

Country	1926	1927	1928	1929	1930
Africa:					
Algeria and Tunisia	152,731	7,339	7,166	37,717	45,843
British—					
East			1,038		
South, Union of			56		
West	20,854	9,588			
Other				108	
Canary Islands	290,303				
Egypt	359,434	71,431	44,514	45,958	51,185
French	122,185				
Liberia	11			1	
Morocco	19,706				
Portuguese—					
Mozambique	3,920				
Other Portuguese	137,392				
	1,106,536	88,358	52,774	83,784	97,028
Oceania:					
British—					
Australia	8,298			39	2,252
New Zealand	1,128				
French		25	6		
	9,426	25	6	39	2,252
Grand total	35,271,937	18,011,744	16,164,485	17,429,298	15,877,407

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[1] Amounts stated do not include fuel or bunker coal loaded on vessels engaged in the foreign trade, which aggregated, in 1926, 7,735,606 tons; in 1927, 4,565,278 tons; in 1928, 4,294,223 tons; in 1929, 4,286,519 tons; and in 1930, 3,496,680.

TABLE 75.—*Bituminous coal exported, by districts and ports, 1926–1930, in net tons*

[Compiled from the records of the Bureau of Foreign and Domestic Commerce]

Customs district	Principal ocean port or rail gateway	1926	1927	1928	1929	1930
North Atlantic:						
Massachusetts	Boston	3	20	2,284		75
Rhode Island			3		11	
New York	New York	108,993	11,265	9,992	12,353	3,207
Philadelphia	Philadelphia	2,224,058	340,011	122,792	198,592	133,010
Maryland	Baltimore	6,465,788	392,366	193,788	357,872	260,406
Virginia	Hampton Roads	12,205,095	2,587,847	1,858,345	2,169,134	1,843,602
South Atlantic:						
South Carolina	Charleston	580,708	230,609	92,688	93,633	77,539
Florida	Pensacola	57,761	1,852	480	13,273	28,138
Mobile	Mobile	35,991	26,905	23,974	15,406	4,946
New Orleans	New Orleans	54,678	3,796	5,470	4,575	3,061
Galveston		876	488	103	262	
Sabine		39				
Mexican border:						
Arizona		67,290	77,351	33,419	30,625	16,061
El Paso		46,050	36,478	42,334	32,826	30,099
San Antonio		2,326	2,820	1,511	1,243	1,497
Pacific coast:						
Washington [1]		35,723	21,164	24,045	31,854	23,959
San Francisco		645	245	114	128	99
Los Angeles		54	317	149	474	65
San Diego						32
Lake Erie ports: Ohio [2]	Lower lake docks	5,730,535	6,223,502	6,601,978	6,616,476	6,745,157
Rail gateways on Canadian border:						
Eastern—						
Maine and New Hampshire.		50,173	40,389	29,107	46,870	41,451
Vermont		6,208	6,035	4,786	6,994	4,321
St. Lawrence		1,502,247	1,776,907	1,289,755	1,058,804	812,338
Rochester [3]		798,741	781,850	1,520,669	2,144,239	1,652,752
Buffalo		2,819,487	2,950,844	2,290,730	2,556,917	2,536,678
Michigan		2,290,484	2,303,082	1,882,254	1,959,518	1,602,902
Western—						
Duluth, Superior, and International Falls.		97,815	107,078	74,530	43,137	39,517
Dakota		89,942	88,013	58,889	33,540	16,253
Montana-Idaho		1	6		270	151
Miscellaneous:						
Alaska		11	235	69	151	19
Porto Rico		215	266	230	121	72
		35,271,937	18,011,744	16,164,485	17,429,298	15,877,407

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[1] Both rail to Canada and by tide to foreign ports.

[2] Lower lake docks as follows: Toledo, Sandusky, Huron, Lorain, Cleveland, Fairport, Ashtabula Conneaut, and Erie.

[3] Rail, car ferry, and Lake Ontario.

TABLE 76.—*Anthracite exported, by countries, 1926–1930, in net tons*

[Compiled from the records of the Bureau of Foreign and Domestic Commerce]

Country	1926	1927	1928	1929	1930
North America:					
Bermudas	896	1,644	2,098	346	3,384
British Honduras	468		787	1	
Canada	3,941,718	3,238,564	3,296,487	3,376,303	2,532,135
Central America—					
Costa Rica	28		2		
Guatemala	141	942	966	25	85
Honduras	96	84	210	78	67
Nicaragua	1			683	
Panama	463	684	435		
Salvador	16	20	21	152	22
Mexico	5,233	8,605	1,674	1,887	802
Miquelon and St. Pierre Islands	389	652	105	256	441
Newfoundland and Labrador	21,690	17,678	17,168	13,537	5,131
West Indies—					
British—					
Barbados	116	56	56	28	28
Jamaica	29			19	22
Trinidad and Tobago	336				
Other British	304	148	232	84	612
Cuba	55,029	50,202	10,887	11,480	7,707
Dominican Republic	702	18	65	62	22
Haiti	1			1	4
Netherlands	75	150	69	321	150
Virgin Islands of the United States		33			
	4,027,731	3,319,480	3,331,262	3,405,263	2,550,612
South America:					
Argentina	123	179	4		
Bolivia	189				
Chile				22	
Colombia	78	802	197	32	67
Ecuador			56	125	54
Guiana—British	569				
Uruguay	225	94			
Venezuela	37	39	35	40	25
	1,221	1,114	292	219	146
Europe:					
Azores and Madeira Islands	10				
France		518	1	12	
Germany				1	
Greece	11				
Italy	112			2	
Portugal	152				
United Kingdom	401	4,393	3,463	1	2
	686	4,911	3,464	16	2
Asia:					
Japan	45				
Philippine Islands			11		
Soviet Russia			10		
	45		21		
Africa:					
Liberia		2	1	1	
Mozambique				836	899
Portuguese, other			1,231		
		2	1,232	837	899
Oceania:					
Australia				34	
French			1		
			1	34	
Grand total	4,029,683	3,325,507	3,336,272	3,406,369	2,551,659

TABLE 77.—*Anthracite exported, by districts and ports, 1926–1930, in net tons*

[Compiled from the records of the Bureau of Foreign and Domestic Commerce]

Customs district	Principal ocean port or rail gateway	1926	1927	1928	1929	1930
North Atlantic:						
Massachusetts	Boston	441	619	454	256	177
Rhode Island			5			
New York	New York	115, 526	100, 422	77, 215	78, 972	61, 106
Philadelphia	Philadelphia	80, 897	57, 430	29, 111	37, 382	18, 716
Maryland	Baltimore	41		1, 014	256	283
Virginia	Hampton Roads	84	5, 863	101	858	
		196, 989	164, 339	107, 895	117, 724	80, 282
South Atlantic:						
Georgia	Savannah		221			
Florida	Pensacola	101	8	40	8	585
Mobile	Mobile	96		50	1	
New Orleans	New Orleans	143	84	268	209	67
Sabine					29	
		340	313	358	247	652
Mexican border:						
Arizona		2, 379	513	85	179	175
El Paso		1, 458	7, 115	726	1, 277	566
San Antonio		1, 197	862	833	236	7
		5, 034	8, 490	1, 644	1, 692	748
Pacific coast:						
Washington		231	748	3, 360	1, 191	
San Francisco		16	20	32	116	22
Los Angeles		103	82	16	78	7
San Diego [1]						31
		350	850	3, 408	1, 385	60
Lake Erie ports: Ohio [2]	Lower lake docks	20, 558	409	9, 130	8, 754	30, 126
Rail gateways on Canadian border:						
Eastern—						
Maine and New Hampshire		675	157	206	3, 157	38
Vermont		3, 633	7, 748	3, 249	4, 277	5, 490
St. Lawrence		1, 505, 343	1, 266, 400	1, 242, 595	1, 137, 881	928, 969
Rochester [3]		222, 584	164, 213	237, 314	177, 648	129, 279
Buffalo		2, 041, 218	1, 691, 599	1, 708, 010	1, 937, 374	1, 360, 101
Michigan		14, 792	5, 841	11, 859	5, 347	5, 572
		3, 788, 245	3, 135, 958	3, 203, 233	3, 265, 684	2, 429, 449
Western—						
Duluth, Superior, and International Falls		5, 615	5, 984	4, 403	3, 898	2, 826
Dakota		12, 552	9, 130	6, 201	6, 985	7, 516
Montana-Idaho			2			
		18, 167	15, 116	10, 604	10, 883	10, 342
Miscellaneous: Porto Rico			32			
Grand total		4, 029, 683	3, 325, 507	3, 336, 272	3, 406, 369	2, 551, 659

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[1] Included in Los Angeles prior to June 20, 1930.

[2] Chiefly Buffalo and Erie.

[3] Rail, car ferry, and Lake Ontario.

TABLE 78.—*Anthracite and bituminous coal exported to Canada and to all other countries, by months, 1929 and 1930, in net tons*

[Compiled from the records of the Bureau of Foreign and Domestic Commerce]

	January	February	March	April	May	June	July	August	September	October	November	December	Year
1929													
Anthracite:													
Canada	330, 700	305, 946	173, 131	177, 138	273, 393	209, 900	220, 898	245, 404	354, 364	441, 991	297, 663	345, 775	3, 376, 303
All other	2, 891	753	998	2, 182	2, 585	1, 661	292	3, 138	7, 673	1, 717	1, 293	4, 883	30, 066
	333, 591	306, 699	174, 129	179, 320	275, 978	211, 561	221, 190	248, 542	362, 037	443, 708	298, 956	350, 658	3, 406, 369
Bituminous (not including bunker coal):													
Canada	813, 281	720, 121	744, 276	726, 085	1, 358, 362	1, 672, 358	1, 718, 847	1, 386, 661	1, 622, 882	1, 548, 693	1, 398, 326	935, 109	14, 645, 001
All other	213, 891	175, 941	240, 298	226, 691	211, 749	255, 074	229, 490	226, 524	204, 282	255, 066	266, 324	278, 967	2, 784, 297
	1, 027, 172	896, 062	984, 574	952, 776	1, 570, 111	1, 927, 432	1, 948, 337	1, 613, 185	1, 827, 164	1, 803, 759	1, 664, 650	1, 214, 076	17, 429, 298
Fuel or bunker coal loaded on vessels engaged in foreign trade	318, 185	298, 825	316, 747	404, 569	378, 120	351, 368	394, 253	379, 207	388, 396	383, 995	373, 172	299, 682	4, 286, 519
1930													
Anthracite:													
Canada	301, 660	292, 875	166, 200	137, 483	202, 027	160, 428	139, 679	228, 194	220, 172	280, 051	204, 222	199, 144	2, 532, 135
All other	1, 745	579	165	184	5, 752	349	4, 838	861	1, 717	3, 066	113	155	19, 524
	303, 405	293, 454	166, 365	137, 667	207, 779	160, 777	144, 517	229, 055	221, 889,	283, 117	204, 335	199, 299	2, 551, 659
Bituminous (not including bunker coal):													
Canada	756, 890	659, 994	648, 881	775, 851	1, 430, 995	1, 437, 080	1, 627, 604	1, 437, 687	1, 493, 587	1, 343, 884	1, 283, 382	707, 283	13, 603, 118
All other	310, 376	274, 728	198, 717	184, 891	235, 835	124, 100	153, 743	167, 694	143, 218	130, 880	158, 089	192, 018	2, 274, 289
	1, 067, 266	934, 722	847, 598	960, 742	1, 666, 830	1, 561, 180	1, 781, 347	1, 605, 381	1, 636, 805	1, 474, 764	1, 441, 471	899, 301	15, 877, 407
Fuel or bunker coal loaded on vessels engaged in foreign trade	317, 315	294, 850	311, 301	327, 552	311, 680	309, 575	318, 036	292, 688	301, 644	257, 972	229, 011	225, 056	3, 496, 680

SHIPMENTS TO ALASKA, HAWAII, AND PORTO RICO

In addition to the export trade proper, the United States supplies a small tonnage to the Territories of Alaska, Hawaii, and Porto Rico. As shown in Table 79, the movement to Alaska is relatively steady, but shipments to Hawaii and Porto Rico vary widely from year to year. In 1930 a total of 71,508 tons of coal was shipped to the three Territories, of which 37,128 tons went to Alaska, 33,246 tons to Porto Rico, and 1,134 tons to Hawaii.

TABLE 79.—*Shipments of coal to Alaska, Hawaii, and Porto Rico, 1919–1930, in net tons*

[Compiled from the records of the Bureau of Foreign and Domestic Commerce]

Year	Alaska (all coal)	Hawaii (all coal)	Porto Rico (all coal)	Year	Alaska (all coal)	Hawaii (all coal)	Porto Rico (all coal)
1919	57, 166	42, 495	83, 492	1925	37, 324	4, 906	72, 224
1920	38, 128	17, 634	104, 021	1926	35, 620	10, 885	120, 457
1921	24, 278	9, 249	55, 800	1927	39, 443	7, 870	54, 311
1922	28, 457	846	55, 356	1928	39, 184	2, 549	31, 641
1923	34, 082	25, 344	49, 302	1929	36, 694	6, 607	53, 096
1924	40, 161	49, 074	58, 434	1930	37, 128	1, 134	33, 246

WORLD PRODUCTION OF COAL

The same influences that curtailed the production of coal in the United States during 1930 were in evidence throughout the world. From the record output of 1,560,000,000 metric tons in 1929, the total world production of all grades dropped to 1,413,000,000 tons, a decrease of 9.4 per cent. Of the total production, 1,219,000,000 tons was anthracite and bituminous, and 194,000,000 was lignite, or brown coal. In comparison with the previous year, the output of lignite shows a decrease of 15.7 per cent, while a more moderate decline of 8.3 per cent is shown in the output of bituminous coal and anthracite. The long-time changes are shown graphically in Figure 49.

With the exception of Russia, nearly all of the important coal-producing countries shared in this decline. In Great Britain production declined by 5.4 per cent, in Czechoslovakia by 14.0 per cent, in Germany by 14.6 per cent, in Canada by 14.9 per cent, and in Poland by 18.9 per cent. In contrast to the general decline that characterized the coal industry in most of the principal producing countries, a substantial increase of 8.4 per cent is reported in the output of Soviet Russia. Since 1925 production in Russia has more than doubled and in 1930 amounted to over 46,000,000 tons. This substantial growth may be largely explained by the intensive industrialization plan that is being carried out in that country.

In spite of the sharp reduction that occurred during the past year the United States still remains by far the most important coal producer, and in 1930 accounted for more than a third of the total world production.

Table 81 gives the production of coal by countries from 1926 to 1930. It is based upon official reports supplemented, where necessary, by trade information. Similar data by countries for the years 1888 to 1912 will be found in Coal in 1925, pages 491 to 494; for 1913 to 1922 in Coal in 1922, pages 575 to 577; and for 1923 to 1925 in Coal in 1926, pages 532 to 533.

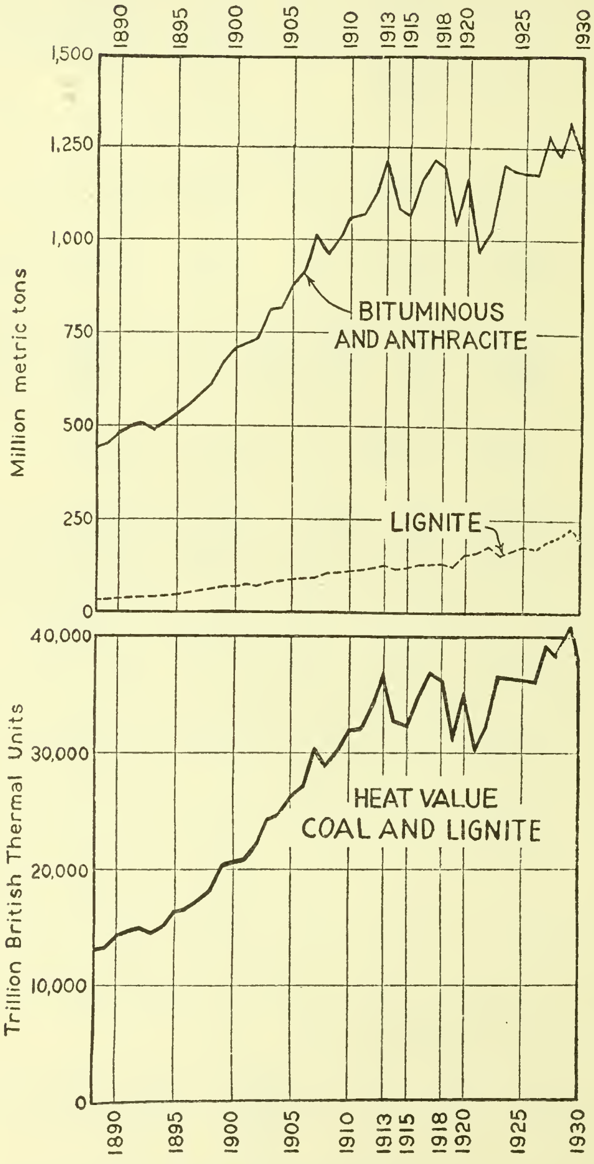

FIGURE 49.—World production of coal and lignite, 1888–1930

TABLE 80.—*World production of coal and lignite, 1888–1930*

[All countries known to have produced coal are included. Estimates are included for China in the years 1888 to 1905 and for certain of the very small producing countries in the years for which no data were obtainable, but in no year does the tonnage estimated exceed 1.1 per cent of the total]

Year	Million metric tons			Heat value		Year	Million metric tons			Heat value	
	Coal	Lignite	Total	Trillion B. t. u.	Index numbers, 1913=100		Coal	Lignite	Total	Trillion B. t. u.	Index numbers, 1913=100
1888	442	33	475	13,226	36.0	1910	1,059	107	1,166	32,001	87.1
1889	450	36	486	13,513	36.8	1911	1,074	111	1,185	32,471	88.4
1890	478	38	516	14,343	39.1	1912	1,128	120	1,248	34,141	93.0
1891	498	40	538	14,942	40.7	1913	1,213	129	1,342	36,724	100.0
1892	503	41	544	15,098	41.1	1914	1,086	121	1,207	32,941	89.7
1893	491	43	534	14,795	40.3	1915	1,069	124	1,193	32,476	88.4
1894	514	45	559	15,498	42.2	1916	1,159	132	1,291	35,164	95.8
1895	542	48	590	16,331	44.5	1917	1,223	133	1,356	37,015	100.8
1896	557	51	608	16,806	45.8	1918	1,198	135	1,333	36,301	98.8
1897	584	55	639	17,636	48.0	1919	1,044	129	1,173	31,799	86.6
1898	614	59	673	18,565	50.6	1920	1,166	153	1,319	35,637	97.0
1899	673	62	735	20,297	55.3	1921	970	164	1,134	30,104	82.0
1900	708	69	777	21,386	58.2	1922	1,047	181	1,228	32,536	88.6
1901	725	75	800	21,967	59.8	1923	1,198	161	1,359	36,647	99.8
1902	741	73	814	22,395	61.0	1924	1,186	171	1,357	36,445	99.2
1903	813	76	889	24,509	66.7	1925	1,187	185	1,372	36,624	99.7
1904	820	79	899	24,746	67.4	1926	1,179	185	1,364	36,399	99.1
1905	865	84	949	26,102	71.1	1927	1,277	200	1,477	39,419	107.3
1906	924	90	1,014	27,884	75.9	1928	1,248	216	1,464	38,771	105.6
1907	1,019	99	1,118	30,748	83.7	1929	1,330	230	1,560	41,333	112.6
1908	964	105	1,069	29,236	79.6	1930	1,219	194	1,413	37,666	102.6
1909	1,009	106	1,115	30,540	83.2						

TABLE 81.—*Coal and lignite produced in the principal countries of the world in the calendar years 1926–1930, in metric tons*

[Compiled by L. M. Jones, of the Bureau of Mines]

Country	1926	1927	1928	1929	1930
North America:					
Canada—					
Coal	11,687,032	12,340,507	12,439,470	12,272,806	10,367,432
Lignite	3,261,599	3,468,793	3,494,505	3,599,720	3,132,608
Greenland	1,500	2,900	3,000	3,600	4,800
Mexico	1,309,138	1,031,308	1,022,475	1,054,196	1,294,259
United States—					
Anthracite	76,599,968	72,661,094	68,354,261	66,975,462	62,944,536
Bituminous and lignite	520,147,061	469,704,558	454,265,822	485,330,952	424,130,508
South America:					
Argentina	(1)	(1)	(1)	(1)	(1)
Brazil	[2] 400,000	[2] 400,000	[2] 400,000	[2] 400,000	[2] 400,000
Chile	1,490,509	1,481,511	1,375,616	1,507,866	1,441,370
Colombia	(1)	(1)	(1)	(1)	(1)
Peru	170,070	158,601	177,513	219,654	200,014
Venezuela	[3] 15,928	[3] 16,104	[3] 15,812	[3] 16,859	9,443
Europe:					
Albania—Lignite	1,558	3,115	2,985	4,117	4,283
Austria—					
Coal	157,308	175,601	202,098	208,020	215,888
Lignite	2,957,728	3,064,068	3,262,570	3,524,792	3,062,981
Belgium	25,259,600	27,550,960	27,578,300	26,939,930	27,405,560
Bulgaria—					
Coal	62,150	69,192	70,336	72,478	70,567
Lignite	1,140,093	1,168,454	1,360,790	1,572,964	1,522,361
Czechoslovakia—					
Coal	14,176,998	14,016,300	14,560,305	16,521,457	14,435,002
Lignite	18,515,666	19,620,637	20,451,421	22,560,796	19,193,669
France—					
Coal	51,391,523	51,791,821	51,365,247	53,779,780	53,884,035
Lignite	1,061,122	1,083,041	1,074,627	1,197,220	1,142,733

[1] Estimate included in total.

[2] Approximate production.

[3] Exclusive of output of State of Falcon (about 8,000 tons), for which estimate is included in total.

TABLE 81.—*Coal and lignite produced in the principal countries of the world in the calendar years 1926–1930, in metric tons*—Continued

Country	1926	1927	1928	1929	1930
Europe—Continued.					
Germany [4]—					
Coal	145,295,724	153,599,355	150,860,599	163,440,632	142,697,760
Lignite	139,150,557	150,503,914	165,588,097	174,455,946	145,913,818
Saar [5]	13,680,874	13,595,824	13,106,718	13,579,348	13,235,771
Greece—Lignite	153,321	143,346	120,639	156,526	(1)
Hungary—					
Coal	827,710	785,922	783,279	826,270	811,548
Lignite	5,822,159	6,244,275	6,510,070	7,043,920	6,176,484
Irish Free State	79,715	(1)	(1)	86,554	(1)
Italy—					
Coal	209,260	168,528	127,932	223,348	231,126
Lignite	1.181,342	912,458	697,033	782,045	576,860
Netherlands—					
Coal	8,842,687	9,488,412	10,920,054	11,581,202	12,211,084
Lignite	211,194	201,382	196,696	156,568	(1)
Poland—					
Coal	35,747,348	38,084.086	40,616,384	46,236,037	37,505,649
Lignite	76,026	78,464	73,560	74,321	54,962
Portugal—					
Coal	201,732	178,554	201,348	196,901	(1)
Lignite	30,699	25,713	26,450	29,343	(1)
Rumania—					
Coal	322,191	373,457	397,564	370,947	298,825
Lignite	2,731,362	2,850,011	2,629,676	2,675,080	2,071,057
Russia [6]—					
Coal	20,614,717	25,944,341	28,827,819	36,384,000	39,952,000
Lignite	1,605,327	1,763,196	1,978,570		
Spain—					
Coal	6,536,087	6,562.936	6,370,508	7,108,316	7,119,807
Lignite	399,830	429,602	422,504	438,951	388,032
Svalbard (Spitsbergen)	[7] 291,211	[7] 303,000	275,019	251,185	[8] 192,450
Sweden	383,673	398,298	358,513	394,975	397,960
Switzerland	(1)	[2] 7.000	[2] 7,000	[2] 7,000	[2] 4,000
Turkey—Lignite	4,638	4,000	(1)	312	800
United Kingdom—					
Great Britain	128,305,291	255,264,615	241,283,355	262,046,206	247,796,127
Northern Ireland—Lignite	(1)	510	650	327	(1)
Yugoslavia—					
Coal	190,814	287,728	457,472	408,611	366,203
Lignite	3,976,938	4,458,481	4,694,408	5,242,527	4,909,679
Asia:					
British Borneo	92,583	80,466	79,721	73,100	74,345
China	23,040,119	24,172,009	25,091,760	(1)	(1)
Chosen	682,896	709.578	815,817	937,902	884,138
Federated Malay States	471,736	470,432	565,523	672.131	574,650
India, British	21,336,204	22,436,757	22,904,685	23,794,605	22,942,976
Indo-China—					
Coal	1,284,661	1,482,900	1,954,098	1,941,310	1,937,000
Lignite	5,598	7,000	15,472	30,713	29,000
Japan—					
Japan proper—					
Coal	31,296,168	33,387,160	33,694,298	34,100,000	(1)
Lignite	161,134	178,613	121,923	139.031	(1)
Karafuto	275.823	357,046	539,481	635,515	(1)
Taiwan	1,794,511	1,857,257	1,583,598	1,530,025	(1)
Netherland East Indies	1,466,359	1,620,205	1,703,526	1,831,741	1,869,638
Philippine Islands	28,577	23,410	27,857	17,321	20,751
Russia [6]—					
Coal	[9] 2,849,399	[9] 3,907,499	[9] 3,916,129	6,489,000	6,504,000
Lignite	694,366	869,262	903,758		
Sakhalin—Coal	19,624	46,274	126,551		
Turkey—					
Coal	1,222,387	[10] 896,074	[10] 923,403	[10] 985,035	[10] 1,139,652
Lignite	7,569	6,555	5,169	7,659	7,372
Africa:					
Algeria	13,731	21,269	16,631	16,130	17,193
Belgian Congo—					
Coal	90,250	86,950	97,780	114,450	133,800
Lignite	------------	------------	------------	2,800	------------
Madagascar	------------	5	33	26	------------
Nigeria	329,784	363,643	365,083	350,473	364,000
Portuguese East Africa	10,868	15,834	6,455	(1)	(1)
Southern Rhodesia	874,140	908,744	1,094,843	1,036,816	938,736
Union of South Africa	12,949,950	12,580,314	12,606,576	13,018,328	12,222,501

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[1] Estimate included in total.

[2] Approximate production.

[4] Exclusive of mines in the Saar under French control.

[5] Mines under French control.

[6] Year ended Sept. 30.

[7] Production less consumption at mines, for which data are not available.

[8] Exports.

[9] Exclusive of Sakhalin.

[10] Shipments

Table 81.—*Coal and lignite produced in the principal countries of the world in the calendar years 1926–1930, in metric tons*—Continued

Country	1926	1927	1928	1929	193
Oceania:					
Australia—					
New South Wales	11, 060, 483	11, 304, 688	9, 599, 841	7, 740, 000	7, 206, 899
Queensland	1, 240, 657	1, 116, 680	1, 093, 615	1, 390, 713	1, 112, 246
Tasmania	104, 000	113, 854	130, 562	132, 382	140, 942
Victoria—					
Coal	600, 487	695, 227	668, 889	715, 124	(1)
Lignite	973, 310	1, 478, 842	1, 617, 407	1, 769, 122	(1)
Western Australia	482, 440	509, 554	536, 901	553, 462	509, 473
New Caledonia	15, 000	9, 000	16, 565	21, 000	9, 670
New Zealand—					
Coal	1, 215, 590	1, 311, 247	1, 370, 379	1, 389, 107	1, 403, 873
Lignite	1, 060, 361	1, 093, 484	1, 105, 483	1, 187, 458	1, 179, 019
Total, all grades	1, 364, 000, 000	1, 477, 000, 000	1, 464, 000, 000	1, 560, 000, 000	1, 413, 000, 000
Lignite (total of items shown above)	185, 000, 000	200, 000, 000	216, 000, 000	230, 000, 000	194, 000, 000
Bituminous and anthracite (by subtraction)	1, 179, 000, 000	1, 277, 000, 000	1, 248, 000, 000	1, 330, 000, 000	1, 219, 000, 000

[1] Estimate included in total.

DETAILED STATISTICS OF BITUMINOUS COAL, BY STATES AND COUNTIES

TABLES OF PRODUCTION, VALUE, MEN EMPLOYED, DAYS WORKED, AND OUTPUT PER MAN IN 1930

The following table (Table 82) presents detailed statistics for each coal-producing county from which three or more operators reported production. If less than three reports were received, the figures for two or more counties have been combined to avoid disclosing individual returns, unless permission to publish has been granted by the producers.

The series gives the details of total value of product, average value per ton, men employed by broad occupational groups, average number of days worked by the mines, and output per man per day. The figures include stripping operations as well as deep mines. Separate particulars for the stripping operations in each county are given in Table 49. If the reader will deduct the stripping figures as given in that table from the totals for all mines in the following table, he will find that the remainder represents the operations of the deep mines. By this means figures can be obtained for the deep mines separately in any State or county desired.

TABLE 82.—*Production, value, men employed, days worked, and output per man per day at bituminous-coal mines in specified States and counties in 1930*

[Note that figures relate only to active mines of commercial size; no canvass was made of wagon mines producing less than 1,000 tons. Waste and refuse are not included in tonnage]

County	Net tons					Value		Number of employees					Average number of days worked	Average tons per man per day
								Underground						
	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for power and heat	Made into coke at mines	Total quantity	Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total		
ALABAMA														
Bibb	799, 743	5, 877	17, 187		822, 807	$1, 952, 000	$2. 37	1, 041	176	109	188	1, 514	162	3. 34
Blount	287, 719	3, 561	3, 432		294, 712	637, 000	2. 16	479	59	36	98	672	152	2. 89
Cullman		7, 559			7, 559	22, 000	2. 91	18	4	4	5	31	182	1. 34
Jefferson	7, 604, 404	168, 990	26, 739		7, 800, 133	15, 583, 000	2. 00	6, 972	1, 243	1, 730	1, 529	11, 474	210	3. 24
Marion	265, 977	1, 825			267, 802	748, 000	2. 79	418	35	46	88	587	148	3. 09
St. Clair	693, 948	39, 322	36, 290		769, 560	1, 640, 000	2. 13	619	109	130	159	1, 017	209	3. 61
Shelby	598, 941	38, 622	726		638, 289	1, 792, 000	2. 81	853	141	120	239	1, 353	209	2. 26
Tuscaloosa	356, 468	9, 742	520		366, 730	804, 000	2. 19	547	99	75	149	870	136	3. 11
Walker	4, 394, 792	66, 552	9, 303		4, 470, 647	8, 182, 000	1. 83	4, 079	809	739	1, 027	6, 654	166	4. 04
Winston	1, 421	1, 422			2, 843	3, 000	1. 06	15	3	3	5	26	82	1. 34
Other counties (Etowah and Fayette)	125, 750	3, 226			128, 976	253, 000	1. 96	132	22	12	29	195	182	3. 64
Total, 1930	15, 129, 163	346, 698	94, 197		15, 570, 058	31, 616, 000	2. 03	15, 173	2, 700	3, 004	3, 516	24, 393	189	3. 38
Total, 1929	17, 459, 449	317, 675	166, 799		17, 943, 923	37, 309, 000	2. 08	15, 287	2, 961	3, 244	3, 716	25, 208	231	3. 08
ALASKA														
Total, 1930	112, 900	6, 000	1, 200		120, 100	$631, 000	$5. 25	40	7	20	32	99	294	4. 13
Total, 1929	94, 600	5, 010	1, 000		100, 610	528, 000	5. 25	50	10	24	68	152	174	3. 81
ARIZONA														
Total, 1930		9, 084			9, 084	$29, 000	$3. 19	18	3	2	1	24	196	1. 94
Total, 1929		10, 060	72		10, 132	44, 000	4. 34	33	2	2	2	39	137	1. 90

ARKANSAS														
Franklin	222, 576	1, 562	2, 599		226, 737	$579, 000	$2. 55	314	58	33	87	492	131	3. 52
Johnson	258, 800	946	3, 013		262, 759	1, 087, 000	4. 14	812	139	122	197	1, 270	87	2. 37
Logan	318, 425	112	30		318, 567	1, 411, 000	4. 43	640	56	91	85	872	119	3. 06
Pope and Scott	92, 373	3, 684	752		96, 809	474, 000	4. 90	186	39	24	37	286	132	2. 56
Sebastian	621, 400	2, 167	4, 995		628, 562	1, 602, 000	2. 55	1, 233	177	117	179	1, 706	127	2. 90
Total, 1930	1, 513, 574	8, 471	11, 389		1, 533, 434	5, 153, 000	3. 36	3, 185	469	387	585	4, 626	115	2. 87
Total, 1929	1, 659, 573	26, 020	9, 515		1, 695, 108	5, 624, 000	3. 32	2, 906	412	316	665	4, 299	146	2. 70
CALIFORNIA, IDAHO, AND OREGON														
Total, 1930	12, 300	4, 713	1, 525		18, 538	$100, 000	$5. 39	57	7	9	65	138	74	1. 81
Total, 1929 [1]	7, 840	2, 222	260		10, 322	37, 000	3. 58	23	3	6	10	42	113	2. 17
COLORADO														
Boulder	261, 248	144, 540	23, 409		429, 197	$1, 151, 000	$2. 68	356	59	26	76	517	194	4. 28
Delta	40, 501	29, 355	500		70, 356	207, 000	2. 94	52	1	8	23	84	131	6. 42
Dolores, Montrose, and Ouray		8, 295	170		8, 465	20, 000	2. 36	10	3	3	3	19	164	2. 72
El Paso	118, 975	215, 567	10, 447		344, 989	754, 000	2. 19	212	32	21	48	313	257	4. 29
Fremont	337, 539	60, 838	4, 601		402, 978	1, 533, 000	3. 80	522	106	97	132	857	180	2. 61
Garfield	10, 546	25, 429	300		36, 275	99, 000	2. 73	30	5	3	9	47	189	4. 09
Gunnison	461, 617	7, 560	30, 450		499, 627	1, 228, 000	2. 46	355	78	58	105	596	189	4. 44
Huerfano	1, 333, 286	23, 436	18, 734		1, 375, 456	4, 088, 000	2. 97	1, 493	251	204	320	2, 268	168	3. 60
Jefferson	99, 169	21, 752	2, 550		123, 471	264, 000	2. 14	74	16	5	22	117	232	4. 55
La Plata	25, 565	20, 929	31	10, 351	56, 876	154, 000	2. 71	59	9	10	19	97	151	3. 89
Las Animas	1, 753, 654	53, 822	27, 331	110, 483	1, 945, 290	4, 747, 000	2. 44	2, 171	293	231	369	3, 064	165	3. 84
Mesa	53, 256	35, 320	2, 607		91, 183	195, 000	2. 14	97	10	14	21	142	176	3. 65
Moffat		7, 637			7, 637	18, 000	2. 36	9	1	1	1	12	176	3. 63
Montezuma	525	4, 444			4, 969	20, 000	4. 02	7	1	1	3	12	214	1. 93
Rio Blanco		5, 599			5, 599	15, 000	2. 68	11	1	1	3	16	137	2. 55
Routt	791, 610	19, 908	27, 310		838, 828	2, 819, 000	3. 36	728	110	123	257	1, 218	100	[2] 6. 89
Weld	1, 662, 093	199, 944	29, 062		1, 891, 099	4, 014, 000	2. 12	1, 168	150	145	155	1, 618	184	6. 36
Other counties (Elbert, Jackson, and Pitkin)	54, 926	7, 072	2, 617		64, 615	159, 000	2. 46	57	8	7	22	94	238	2. 89
Total, 1930	7, 004, 510	891, 447	180, 119	120, 834	8, 196, 910	21, 485, 000	2. 62	7, 411	1, 134	958	1, 588	11, 091	169	4. 38
Total, 1929	8, 664, 817	824, 049	183, 746	248, 129	9, 920, 741	26, 254, 000	2. 65	7, 981	1, 227	1, 226	1, 623	12, 057	187	4. 40

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[1] Includes Nevada.

[2] In this county certain mines have in recent times followed the practice of reducing their forces in periods of dull market and of working every day underground when the tipple works only 1, 2, or 3 days a week. As the days worked represent tipple time, the result is not comparable with the returns for other counties, and the average for the State is affected also.

TABLE 82.—*Production, value, men employed, days worked, and output per man per day at bituminous-coal mines in specified States and counties in 1930*—Continued

County	Net tons					Value		Number of employees					Average number of days worked	Average tons per man per day
								Underground						
	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for power and heat	Made into coke at mines	Total quantity	Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total		
GEORGIA														
Total, 1930	7,033	47	12		7,092	$18,000	$2.54	43	7	4	6	60	71	1.66
Total, 1929	43,921	458	257		44,636	136,000	3.05				102	102	260	1.68
ILLINOIS														
Bond, Clinton, and Marion	715,517	87,776	55,869		859,162	$1,375,000	$1.60	757	181	172	184	1,294	108	6.17
Bureau	184	12,740	400		13,324	41,000	3.08	39	5	5	9	58	171	1.34
Cass, Greene, Morgan, and Scott		6,299			6,299	12,000	1.91	14	1	1	3	19	192	1.73
Christian	3,377,950	139,549	33,122		3,550,621	5,776,000	1.63	1,719	251	274	382	2,626	163	8.29
Crawford and Edgar		12,049	1,348		13,397	29,000	2.16	21	5	4	4	34	140	2.81
Franklin	11,687,197	79,863	127,707		11,894,767	21,764,000	1.83	5,801	1,537	1,855	1,305	10,498	175	6.46
Fulton	1,435,539	135,466	6,125		1,577,130	2,709,000	1.72	814	90	93	249	1,246	163	[3] 7.75
Gallatin	2,350	15,466	119		17,935	35,000	1.95	48	7	8	9	72	70	3.54
Grundy	71,816	28,740	1,220		101,776	267,000	2.62	229	22	82	34	367	80	3.48
Hancock		3,573			3,573	15,000	4.20	10	2	2	3	17	131	1.60
Henry	331,322	82,951	1,259		415,532	629,000	1.51	155	19	15	120	309	212	[3] 6.34
Jackson	1,961,429	50,455	555		2,012,439	2,970,000	1.48	277	91	104	360	832	209	[3] 11.58
Jefferson, Johnson, and White	15,200	9,988	5,147		30,335	52,000	1.71	87	12	7	19	125	66	3.66
Kankakee and Will	828,518	36,201	1,747		866,466	1,732,000	2.00	4	1	1	193	199	274	[3] 15.89
Knox	269,493	63,607	1,236		334,336	747,000	2.23	230	38	26	29	323	243	4.26
La Salle	80,028	241,731	2,358		324,117	994,000	3.07	699	67	104	89	959	121	2.79
Livingston		22,728	775		23,503	85,000	3.62	34	8	5	15	62	161	2.35
Logan, McDonough, and Macon	66,055	157,423	9,265		232,743	629,000	2.70	292	37	57	43	429	202	2.68
Macoupin	4,461,935	63,880	104,825		4,630,640	6,797,000	1.47	2,139	400	701	330	3,570	182	7.13
Madison	1,914,373	257,009	51,222		2,222,604	3,916,000	1.76	1,672	262	266	261	2,461	139	6.50
Marshall		2,040			2,040	5,000	2.45	5	1	1	1	8	88	2.91
Menard		94,820	1,770		96,590	238,000	2.46	129	18	15	20	182	195	2.72
Mercer		21,102	690		21,792	66,000	3.03	38	5	4	8	55	181	2.19
Montgomery	1,534,414	35,607	28,495		1,598,516	2,575,000	1.61	792	156	219	148	1,315	189	6.44
Peoria	766,772	184,142	3,880		954,794	1,743,000	1.83	1,122	144	120	113	1,499	146	4.36

Perry	3, 106, 071	134, 959	43, 383	----------	3, 284, 413	4, 921, 000	1. 50	1, 170	143	102	669	2, 084	146	[3] 10. 78
Putnam and Woodford	27, 000	37, 367	7, 231	----------	71, 598	198, 000	2. 77	222	15	25	23	285	158	1. 59
Randolph	370, 879	56, 940	17, 099	----------	444, 918	808, 000	1. 82	586	103	62	85	836	116	4. 60
Rock Island	----------	16, 882	150	----------	17, 032	48, 000	2. 82	48	6	5	10	69	115	2. 15
St. Clair	1, 757, 695	663, 039	53, 448	----------	2, 474, 182	3, 243, 000	1. 31	1, 884	332	285	410	2, 911	139	6. 11
Saline	3, 772, 195	84, 331	64, 858	----------	3, 921, 384	7, 504, 000	1. 91	2, 851	515	413	492	4, 271	155	5. 92
Sangamon	3, 283, 870	363, 127	40, 682	----------	3, 687, 679	6, 337, 000	1. 72	3, 893	460	523	408	5, 284	137	5. 08
Schuyler	----------	24, 676	----------	----------	24, 676	51, 000	2. 07	36	7	8	8	59	145	2. 87
Shelby	3, 722	40, 362	4, 435	----------	48, 519	123, 000	2. 54	103	11	19	15	148	133	2. 46
Stark	----------	13, 409	----------	----------	13, 409	41, 000	3. 06	33	5	5	8	51	147	1. 78
Tazewell	252, 135	182, 152	3, 249	----------	437, 536	850, 000	1. 94	430	48	36	60	574	178	4. 29
Vermilion	2, 599, 470	293, 965	21, 048	----------	2, 914, 483	5, 578, 000	1. 91	2, 020	280	433	348	3, 081	159	5. 97
Wabash	----------	7, 100	----------	----------	7, 100	15, 000	2. 11	11	2	2	3	18	175	2. 25
Warren	----------	4, 602	----------	----------	4, 602	17, 000	3. 69	12	1	1	2	16	168	1. 71
Washington	429, 841	82, 784	18, 519	----------	531, 144	910, 000	1. 71	184	51	31	57	323	213	7. 71
Williamson	3, 799, 309	142, 363	102, 452	----------	4, 044, 124	7, 639, 000	1. 89	3, 283	505	622	624	5, 034	130	6. 16
Total, 1930	48, 922, 279	3, 993, 263	815, 688	----------	53, 731, 230	93, 484, 000	1. 74	33, 893	5, 844	6, 713	7, 153	53, 603	156	[3] 6. 42
Total, 1929	55, 712, 372	3, 991, 337	953, 932	----------	60, 657, 641	113, 453, 000	1. 87	36, 781	6, 336	6, 764	6, 844	56, 725	177	[3] 6. 06

INDIANA

Clay	875, 999	40, 900	26, 055	----------	942, 954	$1, 562, 000	$1. 66	326	58	52	316	752	178	7. 05
Daviess	6, 251	15, 656	1, 254	----------	23, 161	47, 000	2. 03	53	8	8	14	83	98	2. 86
Dubois and Martin	----------	8, 300	----------	----------	8, 300	16, 000	1. 93	4	1	1	2	8	197	5. 27
Gibson	814, 619	26, 412	16, 158	----------	857, 189	1, 261, 000	1. 47	248	92	59	89	488	180	9. 73
Greene	1, 658, 240	37, 770	26, 171	----------	1, 722, 181	2, 776, 000	1. 61	569	110	100	297	1, 076	176	9. 07
Knox	1, 351, 156	67, 856	15, 569	----------	1, 434, 581	1, 999, 000	1. 39	729	125	107	162	1, 123	163	7. 85
Owen	84, 430	288	7, 460	----------	92, 178	156, 000	1. 69	21	4	4	57	86	115	9. 36
Parke	6, 000	12, 091	----------	----------	18, 091	36, 000	1. 99	29	4	5	6	44	146	2. 82
Perry, Spencer, and Vanderburg	107, 257	115, 578	10, 034	----------	232, 869	433, 000	1. 86	258	42	57	53	410	121	4. 68
Pike	2, 633, 618	20, 376	55, 810	----------	2, 709, 804	3, 384, 000	1. 25	132	21	16	716	885	192	15. 92
Sullivan	2, 682, 674	58, 791	37, 293	----------	2, 778, 758	5, 093, 000	1. 83	1, 684	352	290	466	2, 792	149	6. 70
Vermillion	1, 639, 958	20, 987	21, 618	----------	1, 682, 563	2, 828, 000	1. 68	1, 327	170	164	271	1, 932	148	5. 87
Vigo	2, 457, 453	425, 520	81, 005	----------	2, 963, 978	5, 322, 000	1. 80	2, 242	413	393	371	3, 419	141	6. 14
Warrick	918, 110	92, 329	12, 916	----------	1, 023, 355	1, 265, 000	1. 24	428	85	71	199	783	196	6. 66
Total, 1930	15, 235, 765	942, 854	311, 343	----------	16, 489, 962	26, 178, 000	1. 59	8, 050	1, 485	1, 327	3, 019	13, 881	157	[3] 7. 56
Total, 1929	17, 387, 599	630, 524	326, 235	----------	18, 344, 358	29, 880, 000	1. 63	8, 852	1, 615	1, 561	3, 222	15, 250	172	[3] 7. 00

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[3] Much of the output is obtained from strip pits or by the use of loading machines, in which types of operations the production per man is large.

TABLE 82.—*Production, value, men employed, days worked, and output per man per day at bituminous-coal mines in specified States and counties in 1930*—Continued

IOWA

County	Net tons					Value		Number of employees					Average number of days worked	Average tons per man per day
								Underground						
	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for power and heat	Made into coke at mines	Total quantity	Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total		
Adams	----------	9,631	800	----------	10,431	$39,000	$3.74	25	1	1	4	31	165	2.04
Appanoose	512,151	73,188	787	----------	586,126	1,478,000	2.52	1,387	147	116	151	1,801	122	2.66
Boone	352,237	56,658	3,889	----------	412,784	1,204,000	2.92	718	78	98	58	952	163	2.66
Dallas	380,909	18,380	2,155	----------	401,444	1,091,000	2.72	497	57	63	36	653	181	3.39
Davis	----------	3,823	----------	----------	3,823	11,000	2.88	9	2	2	3	16	116	2.06
Greene and Webster	----------	7,066	----------	----------	7,066	28,000	3.96	18	4	4	5	31	141	1.62
Guthrie	----------	6,878	----------	----------	6,878	25,000	3.63	26	4	4	6	40	99	1.74
Jasper	----------	55,437	2,700	----------	58,137	146,000	2.51	89	9	6	18	122	195	2.44
Jefferson and Keokuk	----------	4,799	----------	----------	4,799	12,000	2.50	13	2	2	3	20	167	1.44
Lucas	541,780	5,163	11,350	----------	558,293	1,417,000	2.54	524	51	100	50	725	148	5.21
Mahaska	89	53,462	100	----------	53,651	134,000	2.50	113	6	6	26	151	140	2.53
Marion	472,530	50,806	14,421	----------	537,757	1,619,000	3.01	607	97	124	64	892	174	3.47
Monroe	350,767	29,780	1,986	----------	382,533	864,000	2.26	521	59	43	52	675	178	3.19
Page	700	22,408	----------	----------	23,108	96,000	4.15	37	5	5	6	53	211	2.07
Polk	207,027	366,411	10,655	----------	584,093	1,536,000	2.63	822	102	78	80	1,082	170	3.17
Taylor	809	8,673	----------	----------	9,482	36,000	3.80	34	4	3	4	45	124	1.70
Van Buren	3,038	3,216	66	----------	6,320	21,000	3.32	15	1	1	4	21	121	2.48
Wapello	300	83,988	685	----------	84,973	223,000	2.62	143	18	17	26	204	139	2.99
Warren	106,795	28,120	6,217	----------	141,132	352,000	2.49	217	23	34	25	299	152	3.10
Wayne	4,386	15,151	204	----------	19,741	53,000	2.68	68	5	6	9	88	99	2.27
Total, 1930	2,933,518	903,038	56,015	----------	3,892,571	10,385,000	2.67	5,883	675	713	630	7,901	155	3.18
Total, 1929	3,383,801	800,029	57,239	----------	4,241,069	11,948,000	2.82	5,408	655	693	539	7,295	195	2.98

KANSAS

County	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for power and heat	Made into coke at mines	Total quantity	Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total	Average number of days worked	Average tons per man per day
Bourbon	----------	24,895	880	----------	25,775	$56,000	$2.17	7	1	1	38	47	200	2.75
Cherokee	364,790	65,550	3,327	----------	433,667	829,000	1.91	229	23	17	264	533	106	7.67
Crawford	1,684,498	109,316	28,572	----------	1,822,386	3,942,000	2.16	2,390	235	134	697	3,456	117	4.52

Osage	22,363	35,970	80	------	58,413	219,000	3.75	303	34	26	32	395	114	1.29
Other counties (Leavenworth and Linn)	37,500	52,188	------	------	89,688	185,000	2.06	231	74	34	85	424	235	.90
Total, 1930	2,109,151	287,919	32,859	------	2,429,929	5,231,000	2.15	3,160	367	212	1,116	4,855	126	3.96
Total, 1929	2,635,600	251,807	88,564	------	2,975,971	6,697,000	2.25	3,638	333	218	950	5,139	160	3.63
KENTUCKY														
Eastern Kentucky:														
Bell	2,096,353	69,432	13,926	------	2,179,711	$3,209,000	$1.47	2,107	404	353	412	3,276	179	3.71
Boyd	58,310	1,329	6,500	------	66,139	93,000	1.41	92	17	16	15	140	198	2.39
Breathitt	168,808	1,331	3,600	------	173,739	259,000	1.49	185	39	30	39	293	183	3.23
Clay	86,680	450	2,494	------	89,624	122,000	1.36	158	26	17	24	225	162	2.46
Floyd	4,397,061	22,833	22,036	------	4,441,930	6,885,000	1.55	3,012	672	527	603	4,814	198	4.67
Harlan	12,609,929	95,904	36,229	------	12,742,062	20,907,000	1.64	7,400	1,593	1,352	1,575	11,920	214	4.98
Johnson	950,016	8,323	4,512	------	962,851	2,157,000	2.24	694	152	134	136	1,116	192	4.50
Knott	391,455	2,007	3,000	------	396,462	518,000	1.31	243	63	47	92	445	171	5.20
Knox	292,052	8,896	5,212	------	306,160	431,000	1.41	309	48	43	69	469	242	2.69
Laurel	66,550	13,750	1,172	------	81,472	115,000	1.41	165	26	19	21	231	123	2.87
Letcher	5,880,806	50,737	68,006	------	5,999,549	9,956,000	1.66	3,446	835	1,032	571	5,884	220	4.63
Martin	345,476	952	25	------	346,453	377,000	1.09	174	53	46	53	326	174	6.09
Perry	5,148,190	92,902	60	------	5,241,152	7,534,000	1.44	3,147	603	624	714	5,088	186	5.54
Pike	5,862,324	42,421	24,633	------	5,929,378	8,918,000	1.50	3,596	771	699	928	5,994	194	5.09
Whitley	405,675	11,978	16,077	------	433,730	810,000	1.87	584	82	132	139	937	165	2.80
Other counties (Carter, Lee, McCreary, Magoffin, Morgan, and Wayne)	854,089	45,856	3,337	------	903,282	1,563,000	1.73	893	225	209	193	1,520	173	3.43
Total, 1930	39,613,774	469,101	210,819	------	40,293,694	63,854,000	1.58	26,205	5,609	5,280	5,584	42,678	200	4.73
Total, 1929	45,343,012	436,803	245,637	------	46,025,452	76,885,000	1.67	26,047	5,861	5,143	5,632	42,683	239	4.51
Western Kentucky:														
Christian	38,120	1,617	------	------	39,737	47,000	1.18	57	8	4	7	76	167	3.13
Daviess	1,935	74,675	1,142	------	77,752	104,000	1.34	55	9	8	10	82	207	4.58
Henderson	102,080	73,387	12,261	------	187,728	248,000	1.32	240	52	44	42	378	152	3.27
Hopkins	3,850,271	45,033	12,426	------	3,907,730	4,615,000	1.18	2,742	367	552	580	4,241	174	5.30
Muhlenberg	2,795,172	59,377	80,517	------	2,935,066	3,250,000	1.11	2,530	477	642	665	4,314	121	5.63
Ohio	892,436	38,556	6,253	------	937,245	978,000	1.04	813	184	67	124	1,188	173	4.56
Union	838,214	27,769	39,694	------	905,677	975,000	1.08	635	121	161	137	1,054	176	4.89
Webster	1,664,059	25,652	12,657	------	1,702,368	1,894,000	1.11	1,524	220	316	298	2,358	126	5.73
Other counties (Butler, Crittenden, and McLean)	215,798	2,500	3,700	------	221,998	221,000	1.00	206	37	27	35	305	146	5.00
Total, 1930	10,398,085	348,566	168,650	------	10,915,301	12,332,000	1.13	8,802	1,475	1,821	1,898	13,996	148	5.25
Total, 1929	13,782,089	423,358	231,701	------	14,437,148	16,398,000	1.14	10,043	1,725	2,060	2,138	15,966	177	5.10
Total all Kentucky, 1930	50,011,859	817,667	379,469	------	51,208,995	76,186,000	1.49	35,007	7,084	7,101	7,482	56,674	187	4.83
Total all Kentucky, 1929	59,125,101	860,161	477,338	------	60,462,600	93,283,000	1.54	36,090	7,586	7,203	7,770	58,649	222	4.64

TABLE 82.—*Production, value, men employed, days worked, and output per man per day at bituminous-coal mines in specified States and counties in 1930*—Continued

County	Net tons					Value		Number of employees					Average number of days worked	Average tons per man per day
								Underground						
	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for power and heat	Made into coke at mines	Total quantity	Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total		
MARYLAND														
Allegany	1,426,298	99,627	2,506		1,528,431	$2,583,000	$1.69	1,687	252	242	234	2,415	196	3.23
Garrett	721,747	12,201	8,214		742,162	1.107,000	1.49	606	104	51	123	884	199	4.22
Total, 1930	2,148,045	111,828	10,720		2,270,593	3,690,000	1.63	2,293	356	293	357	3,299	197	3.50
Total, 1929	2,518,092	119,829	11,193		2,649,114	4,640,000	1.75	2,170	395	362	362	3,289	246	3.28
MICHIGAN														
Bay, Midland, and Saginaw	609,195	20,802	31,116		661,113	$2,323,000	$3.51	884	182	122	106	1,294	187	2.73
Total, 1930	609,195	20,802	31,116		661,113	2,323,000	3.51	884	182	122	106	1,294	187	2.73
Total, 1929	744,517	10,725	49,627		804,869	2,904,000	3.61	899	164	154	119	1,336	217	2.77
MISSOURI														
Adair	100,949	29,596	3,429		133,974	$318,000	$2.37	242	37	48	44	371	169	2.14
Audrain		7,478			7,478	34,000	4.55	25	3	4	4	36	176	1.18
Barton	1,489,568	5,067	20,827		1,515,462	3,090,000	2.04	151	23	4	524	702	162	[4] 13.35
Bates	409,216	17,420	3,170		429,806	818,000	1.90	104	14	13	148	279	147	[4] 10.48
Boone		36,525			36,525	117,000	3.20	70	8	9	41	128	137	2.09
Caldwell and Platte	9,560	20,056	2,803		32,419	163,000	5.03	108	8	10	13	139	118	1.98
Callaway		35,006	12		35,018	110,000	3.14	62	9	5	36	112	183	1.70
Cedar, Jasper, and St. Clair	15,135	8,770			23,905	47,000	1.97	3			27	30	103	[4] 7.72
Chariton and Monroe		5,685			5,685	19,000	3.34	16	1	1	4	22	120	2.15
Clay	35,917	40,318	1,093		77,328	237,000	3.06	136	29	31	15	211	225	1.63
Grundy, Harrison, and Schuyler	3,126	6,985	335		10,446	47,000	4.50	52	5	7	7	71	128	1.15
Henry	181,617	48,147	2,100		231,864	460,000	1.98	26	3	3	77	109	189	[4] 11.24
Johnson	20,015	6,858			26,873	66,000	2.46	50	5	6	22	83	198	1.63
Lafayette	310,768	52,930	6,774		370,472	992,000	2.68	770	84	64	82	1,000	172	2.15
Linn	4.603	21,839	100		26,542	92,000	3.47	86	10	7	14	117	114	1.99

Macon	153,843	37,321	5,310		196,474	498,000	2.53	340	56	32	36	464	161	2.63
Putnam	4,138	18,451			22,589	53,000	2.35	76	11	11	17	115	110	1.78
Ralls	20,305	6,435			26,740	68,000	2.54	36	3	2	39	80	155	2.16
Randolph	96,767	82,834	4,514		184,115	470,000	2.55	295	38	44	44	421	186	2.35
Ray	360,694	55,438	3,250		419,382	1,181,000	2.82	897	91	93	83	1,164	174	2.07
Vernon	37,276	2,677	100		40,053	87,000	2.17	15	3	1	27	46	60	[4] 14.56
Total, 1930	3,253,497	545,836	53,817		3,853,150	8,967,000	2.33	3,560	441	395	1,304	5,700	166	4.07
Total, 1929	3,467,666	498,217	64,428		4,030,311	9,778,000	2.43	3,433	402	447	1,336	5,618	185	3.87

MONTANA

Blaine and Chouteau	300	4,824			5,124	$16,000	$3.12	21	3	2	4	30	72	2.37
Carbon	587,447	28,632	31,548		647,627	1,608,000	2.48	356	124	61	165	706	154	5.94
Cascade	275,564	32,475	37		308,076	610,000	1.98	190	35	18	41	284	211	5.14
Dawson		5,737			5,737	10,000	1.74	4	1	1	2	8	219	3.28
Fergus		5,071			5,071	17,000	3.35	7	1	1	2	11	177	2.60
Hill		5,068			5,068	17,000	3.35	10	1	1	3	15	200	1.69
Judith Basin		4,648			4,648	16,000	3.44	5	1	1	3	10	171	2.72
Musselshell	878,804	16,707	6,832		902,343	1,978,000	2.19	486	70	61	124	741	162	7.54
Pondera and Toole		1,825			1,825	12,000	6.58	6				6	183	1.66
Richland	21,346	10,601			31,947	79,000	2.47	36	7	5	11	59	107	5.04
Roosevelt		6,198			6,198	16,000	2.58	11	1	1	4	17	134	2.72
Rosebud	1,063,867	1,039	1,460		1,066,366	1,601,000	1.50	5			128	133	288	[5] 27.86
Sheridan		20,836	25		20,861	40,000	1.92	31	3	2	7	43	153	3.18
Wibaux		7,958			7,958	14,000	1.76	11	1	1	2	15	186	2.85
Other counties (Daniels, Golden Valley, and McCone)	50	3,105			3,155	9,000	2.85	6			1	7	151	2.98
Total, 1930	2,827,378	154,724	39,902		3,022,004	6,043,000	2.00	1,185	248	155	497	2,085	172	8.45
Total, 1929	3,221,905	137,790	47,831		3,407,526	7,561,000	2.22	1,326	303	202	452	2,283	189	7.90

NEW MEXICO

Colfax	961,907	13,874	16,882		992,663	$2,913,000	$2.93	803	77	125	156	1,161	139	6.13
Lincoln and Socorro	7,080	487	780		8,347	24,000	2.88	9	3	3	2	17	183	2.69
McKinley	711,784	33,363	27,312		772,459	2,320,000	3.00	788	154	83	147	1,172	180	3.66
Rio Arriba	19,911	173	358		20,442	55,000	2.69	18	4	2	6	30	221	3.08
Sandoval and Santa Fe	149,016	5,191	14,426		168,633	685,000	4.06	327	50	12	117	506	251	1.33
San Juan	350	6,539			6,889	20,000	2.90	11	2	1	2	16	158	2.72
Total, 1930	1,850,048	59,627	59,758		1,969,433	6,017,000	3.06	1,956	290	226	430	2,902	176	3.85
Total, 1929	2,514,971	51,228	56,570		2,622,769	8,314,000	3.17	2,107	350	294	482	3,233	214	3.79

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[4] The output is obtained chiefly from strip pits, in which the production per man per day is large. The tipple of one of the Barton County mines is in Kansas, but the coal is accredited to Missouri.

[5] The output is obtained from strip pits, in which the production per man per day is large.

TABLE 82.—*Production, value, men employed, days worked, and output per man per day at bituminous-coal mines in specified States and counties in 1930*—Continued

NORTH CAROLINA

County	Net tons					Value		Number of employees					Average number of days worked	Average tons per man per day
	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for power and heat	Made into coke at mines	Total quantity	Total	Average per ton	Underground			Surface	Total		
								Miners, loaders, and shot firers	Haulage and track	All others				
Total, 1930	24,464	1,276	2,760		28,500	$100,000	$3.51	45	5	5	15	70	290	1.40
Total, 1929	46,280	3,200	2,700		52,180	177,000	3.39	120	10	10	20	160	260	1.25
NORTH DAKOTA (LIGNITE)														
Adams	29,226	21,571	1,216		52,013	$78,000	$1.50	37	5	3	10	55	166	5.70
Bowman	15,371	11,310			26,681	46,000	1.72	13	2	2	14	31	214	4.03
Burke	262,773	3,959			266,732	437,000	1.64				83	83	166	[6] 19.34
Burleigh	178,024	15,354	2,002		195,380	306,000	1.57	105	4	2	36	147	148	8.95
Divide	5,552	14,045			19,597	44,000	2.25	28	6	3	5	42	190	2.45
Dunn		3,524			3,524	7,000	1.99	5	1	1	3	10	152	2.31
Golden Valley and McKenzie		5,219			5,219	10,000	1.92	2	1	1	5	9	174	3.33
Grant	6,156	18,287	200		24,643	43,000	1.74	22	2	2	16	42	163	3.60
Hettinger	3,396	16,562			19,958	35,000	1.75	19	3	2	26	50	137	2.92
McLean	73,982	31,657	3,500		109,139	199,000	1.82	26	3	1	90	120	180	5.06
Mercer	424,546	8,924	3,250		436,720	690,000	1.58	156	18	7	68	249	203	8.63
Morton	11,000	26,621			37,621	70,000	1.86	30	5	3	20	58	163	3.99
Mountrail	137	9,433			9,570	23,000	2.40	15	2	2	9	28	152	2.25
Oliver		3,300			3,300	5,000	1.52				6	6	183	3.00
Stark	10,366	41,725	8,865		60,956	96,000	1.57	43	11	10	16	80	156	4.89
Ward	306,817	60,120	307		367,244	561,000	1.53	74	6	6	70	156	217	[6] 10.83
Williams	8,537	53,323			61,860	118,000	1.91	63	5	5	19	92	186	3.61
Total, 1930	1,335,883	344,934	19,340		1,700,157	2,768,000	1.63	638	74	50	496	1,258	180	7.50
Total, 1929	1,442,988	380,640	38,502		1,862,130	3,157,000	1.70	772	92	74	483	1,421	192	6.84

OHIO

Athens	2, 841, 038	32, 854	15, 518		2, 889, 410	$4, 079, 000	$1. 41	3, 208	329	414	418	4, 369	174	3. 81
Belmont	6, 595, 031	320, 138	30, 815		6, 945, 984	9, 132, 000	1. 31	5, 041	720	634	603	6, 998	189	5. 25
Carroll	220, 033	82, 700			302, 733	437, 000	1. 44	270	45	30	42	387	202	3. 88
Columbiana	171, 481	58, 282	354		230, 117	368, 000	1. 60	220	33	16	35	304	198	3. 83
Coshocton	97, 954	44, 038	748		142, 740	228, 000	1. 60	211	29	17	38	295	158	3. 06
Guernsey	1, 747, 605	131, 909	6, 778		1, 886, 292	2, 528, 000	1. 34	1, 179	211	190	131	1, 711	212	5. 20
Harrison	2, 249, 585	28, 282	19, 111		2, 296, 978	2, 796, 000	1. 22	633	78	212	470	1, 393	188	8. 78
Hocking	492, 993	74, 796	849		568, 638	798, 000	1. 40	688	73	60	109	930	151	4. 04
Holmes		19, 779	30		19, 809	39, 000	1. 97	27	2	2	7	38	203	2. 57
Jackson	45, 694	65, 379	5, 139		116, 212	224, 000	1. 93	156	27	30	28	241	166	2. 90
Jefferson	2, 955, 561	502, 132	12, 311		3, 470, 004	5, 244, 000	1. 51	2, 728	382	349	472	3, 931	202	4. 36
Lawrence		84, 928	1, 771		86, 699	188, 000	2. 17	111	12	13	21	157	196	2. 82
Mahoning	78	64, 527	333		64, 938	172, 000	2. 65	106	9	10	18	143	190	2. 39
Medina, Portage, Summit, and Wayne		24, 841	1, 460		26, 301	76, 000	2. 89	47	6	5	13	71	151	2. 46
Meigs	510, 146	31, 780			541, 926	760, 000	1. 40	523	68	55	82	728	190	3. 91
Morgan and Washington	260, 476	571			261, 047	391, 000	1. 50	342	37	57	43	479	186	2. 92
Muskingum	242, 995	69, 613	4, 187		316, 795	442, 000	1. 40	228	28	27	92	375	198	4. 28
Noble	529, 640	5, 602	7, 413		542, 655	739, 000	1. 36	290	47	55	22	414	268	4. 90
Perry	604, 882	44, 688	275		649, 845	898, 000	1. 38	664	72	55	102	893	176	4. 14
Stark	107, 622	224, 874	2, 484		334, 980	769, 000	2. 30	310	45	45	70	470	224	3. 18
Tuscarawas	419, 981	386, 874	1, 207		808, 062	1, 276, 000	1. 58	771	93	92	146	1, 102	175	4. 19
Vinton	40, 142	8, 126	1, 545		49, 813	59, 000	1. 18	105	13	10	17	145	101	3. 40
Total, 1930	20, 132, 937	2, 306, 713	112, 328		22, 551, 978	31, 643, 000	1. 40	17, 858	2, 359	2, 378	2, 979	25, 574	189	4. 67
Total, 1929	20, 840, 851	2, 708, 715	139, 911		23, 689, 477	35, 733, 000	1. 51	17, 689	2, 452	2, 093	3, 165	25, 399	201	4. 64

OKLAHOMA

Coal	94, 308	2, 623			96, 931	$281, 000	$2. 90	114	20	5	13	152	199	3. 20
Craig		6, 202	40		6, 242	16, 000	2. 56	14	2	2	5	23	135	2. 01
Haskell	113, 728	502	1, 025		115, 255	278, 000	2. 41	75	13	9	52	149	159	4. 87
Latimer	166, 101	3, 641	5, 902		175, 644	505, 000	2. 88	302	40	55	49	446	174	2. 26
Le Flore	453, 777	25, 797	3, 793		483, 367	1, 311, 000	2. 71	803	136	121	152	1, 212	128	3. 11
Mayes and Rogers	53, 882	4, 149	2, 072		60, 103	125, 000	2. 08				62	62	137	[5] 7. 09
Muskogee and Wagoner	158, 849	2, 616	504		161, 969	401, 000	2. 48				138	138	164	[6] 7. 15
Okmulgee	532, 836	2, 187	6, 261		541, 284	1, 351, 000	2. 50	775	144	81	88	1, 088	138	3. 61
Pittsburg	954, 213	5, 911	16, 300		976, 424	3, 087, 000	3. 16	1, 226	270	169	191	1, 856	154	3. 42
Tulsa	163, 710	10, 064	2, 961		176, 735	413, 000	2. 34	136	14	18	130	298	149	3. 98
Total, 1930	2, 691, 404	63, 692	38, 858		2, 793, 954	7, 768, 000	2. 78	3, 445	639	460	880	5, 424	148	3. 49
Total, 1929	3, 601, 911	125, 830	46, 339		3, 774, 080	11, 481, 000	3. 04	3, 944	703	616	1, 058	6, 321	178	3. 36

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[5] The output is obtained from strip pits, in which the production per man per day is large.
[6] The output is obtained chiefly from strip pits, in which the production per man per day is large.

TABLE 82.—*Production, value, men employed, days worked, and output per man per day at bituminous-coal mines in specified States and counties in 1930*—Continued

PENNSYLVANIA (BITUMINOUS)

County	Net tons					Value		Number of employees					Average number of days worked	Average tons per man per day
								Underground						
	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for power and heat	Made into coke at mines	Total quantity	Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total		
Allegheny	14,538,527	2,107,262	80,662		16,726,451	$26,974,000	$1.61	10,437	1,398	1,647	1,394	14,876	230	4.88
Armstrong	3,422,785	104,875	2,961		3,530,621	5,307,000	1.50	3,224	329	368	514	4,435	169	4.71
Beaver	17,847	83,399	669		101,915	203,000	1.99	133	12	15	41	201	200	2.54
Bedford	252,469	150,619	1,254		404,342	802,000	1.98	612	82	60	83	837	127	3.81
Blair	137,513	93,177	1,723	18,859	251,272	491,000	1.95	283	27	26	37	373	169	3.99
Bradford and Lycoming	26,703	7,314			34,017	84,000	2.47	69	9	4	12	94	220	1.65
Butler	789,019	174,544	2,165		965,728	1,613,000	1.67	1,226	142	96	150	1,614	163	3.67
Cambria	13,503,036	2,129,916	120,884	110,999	15,864,835	30,475,000	1.92	14,650	1,719	1,346	1,879	19,594	191	4.23
Center	654,805	63,180	965		718,950	1,237,000	1.72	1,010	86	71	104	1,271	169	3.35
Clarion	1,280,198	27,029	333		1,307,560	2,092,000	1.60	1,294	108	79	133	1,614	221	3.66
Clearfield	3,371,730	136,841	19,704		3,528,275	5,887,000	1.67	4,768	429	374	570	6,141	161	3.58
Clinton	54,919	18,171	438		73,528	130,000	1.77	113	7	6	18	144	196	2.60
Elk	920,501	16,312	14,496		951,309	1,558,000	1.64	1,121	96	84	124	1,425	192	3.48
Fayette	21,580,191	225,907	237,031	1,787,723	23,830,852	42,607,000	1.79	10,467	2,498	3,496	2,605	19,066	219	5.71
Greene	5,003,541	31,388	27,355		5,062,284	8,635,000	1.71	2,183	552	776	620	4,131	206	5.94
Huntingdon	495,876	12,971	11,366		520,213	1,073,000	2.06	582	89	59	108	838	184	3.37
Indiana	7,206,952	269,861	28,386	227,234	7,732,433	12,845,000	1.66	6,223	627	601	904	8,355	195	4.76
Jefferson	2,256,979	34,971	12,034		2,303,984	3,625,000	1.57	1,919	189	236	267	2,611	197	4.49
Lawrence	181,772	21,596	13,117		216,485	568,000	2.62	246	45	33	41	365	226	2.63
Mercer	180,653	27,747	10,110		218,510	557,000	2.55	225	48	41	51	365	215	2.78
Somerset	7,794,378	143,662	96,586		8,034,626	14,145,000	1.76	6,786	875	874	1,156	9,691	195	4.25
Tioga	120,262	56,402	5,230		181,894	548,000	3.01	334	23	36	65	458	145	2.75
Washington	17,165,097	329,683	65,616		17,560,396	28,579,000	1.63	12,420	1,767	1,678	1,690	17,555	194	5.16
Westmoreland	12,809,067	609,308	186,146	608,103	14,212,624	23,274,000	1.64	9,010	1,504	1,477	1,924	13,915	192	5.31
Other counties (Fulton, McKean, and Venango)	120,343	4,433	4,907		129,683	275,000	2.12	117	29	23	12	181	212	3.39
Total, 1930	113,885,163	6,880,568	944,138	2,752,918	124,462,787	213,584,000	1.72	89,452	12,690	13,506	14,502	130,150	198	4.82
Total, 1929	127,064,532	8,048,253	1,095,730	7,307,726	143,516,241	258,607,000	1.80	87,705	13,777	14,563	15,729	131,774	230	4.73

SOUTH DAKOTA (LIGNITE)														
Corson and Ziebach		625			625	$2,000	$3.20	2			1	3	63	3.29
Dewey	1,330	2,550			3,880	9,000	2.32	10	1	1	2	14	110	2.53
Harding		875			875	1,000	1.14	3	1	1	1	6	47	3.13
Meade		1,500			1,500	7,000	4.67	4	1	1	2	8	81	2.31
Perkins		5,930			5,930	12,000	2.02	4	1	1	6	12	170	2.91
Total, 1930	1,330	11,480			12,810	31,000	2.42	23	4	4	12	43	109	2.73
Total, 1929	200	12,654			12,854	38,000	2.96	32				32	127	3.17
TENNESSEE														
Anderson	822,532	40,647	984		864,163	$1,366,000	$1.58	624	99	80	105	908	181	5.25
Campbell	1,205,049	35,296	13,161		1,253,506	2,155,000	1.72	1,370	216	131	231	1,948	203	3.16
Claiborne	811,731	5,653			817,384	1,308,000	1.60	679	140	116	139	1,074	194	3.93
Fentress	376,955	8,070	8,636		393,661	536,000	1.36	283	48	37	90	458	224	3.84
Hamilton	25,720	2,922	153		28,795	54,000	1.88	57	10	5	15	87	106	3.11
Marion	331,068	6,594	1,428		339,090	648,000	1.91	433	39	36	75	583	196	2.97
Morgan	314,884	2,751	9,000	24,900	351,535	518,000	1.47	450	88	222	79	839	197	2.13
Other counties (Cumberland, Grundy, Overton, Putnam, Rhea, Roane, Scott, Sequatchie, Van Buren, and White)	1,004,562	34,736	21,392	21,604	1,082,294	1,832,000	1.69	1,119	184	130	205	1,638	193	3.43
Total, 1930	4,892,501	136,669	54,754	46,504	5,130,428	8,417,000	1.64	5,015	824	757	939	7,535	196	3.48
Total, 1929	5,101,399	63,032	55,001	186,032	5,405,464	9,122,000	1.69	4,880	909	755	1,075	7,619	228	3.11
TEXAS														
Bituminous: Palo Pinto, Webb, and Wise	79,829	1,964	2,529		84,322	$323,000	$3.83	336	45	33	87	501	175	0.96
Total bituminous, 1930	79,829	1,964	2,529		84,322	323,000	3.83	336	45	33	87	501	175	.96
Total bituminous, 1929	103,864	2.814	2,928		109,606	436,000	3.98	360	51	32	91	534	222	.92
Lignite:														
Anderson and Henderson	330,135	11,695	3,828		345,658	595,000	1.72	177	39	53	12	281	196	6.26
Bastrop, Bexar, and Lee	82,903	298	2,427		85,628	86,000	1.00	135	18	11	13	177	178	2.71
Milam	169,410		3,153		172,563	120,000	.70	115	16	9	33	173	165	6.05
Houston and Leon	31,001				31,001	42,000	1.35	50	10	6	9	75	155	2.66
Rains, Titus, and Wood	112,839	1,354	507		114,700	141,000	1.23	64	13	8	13	98	224	5.23
Total lignite, 1930	726,288	13,347	9,915		749,550	984,000	1.31	541	96	87	80	804	185	5.03
Total lignite, 1929	971,501	8,252	11,309		991,062	1,164,000	1.17	525	77	73	104	779	206	6.19
State total, 1930	806,117	15,311	12,444		833,872	1,307,000	1.57	877	141	120	167	1,305	181	3.53
State total, 1929	1,075,365	11,066	14,237		1,100,668	1,600,000	1.45	885	128	105	195	1,313	212	3.95

TABLE 82.—*Production, value, men employed, days worked, and output per man per day at bituminous-coal mines in specified States and counties in 1930*—Continued

County	Net tons					Value		Number of employees					Average number of days worked	Average tons per man per day
								Underground						
	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for power and heat	Made into coke at mines	Total quantity	Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total		
UTAH														
Carbon	3,717,308	32,752	5,606	11,093	3,766,759	$9,245,000	$2.45	1,641	444	386	576	3,047	171	7.25
Emery	347,764	11,194	575		359,533	940,000	2.61	186	26	16	44	272	146	9.04
Uintah		3,498	46		3,544	17,000	4.80	5	1	1	3	10	199	1.78
Other counties (Grand, Iron, Kane, Sevier, and Summit)	120,183	5,900	1,622		127,705	313,000	2.45	93	18	25	39	175	157	4.64
Total, 1930	4,185,255	53,344	7,849	11,093	4,257,541	10,515,000	2.47	1,925	489	428	662	3,504	168	[7] 7.23
Total, 1929	5,072,527	47,955	16,678	23,361	5,160,521	12,725,000	2.47	2,076	467	323	592	3,458	211	[7] 7.09
VIRGINIA														
Dickenson	969,452	15,908	1,812		987,172	$1,292,000	$1.31	484	131	82	150	847	228	5.10
Lee	1,723,727	10,270	5,279		1,739,276	2,791,000	1.60	1,337	281	236	277	2,131	180	4.53
Montgomery	158,254	8,400	675		167,329	451,000	2.70	246	42	42	65	395	167	2.54
Russell	1,234,417	16,278	4,100		1,254,795	1,674,000	1.33	786	231	133	306	1,456	170	5.06
Tazewell	2,498,166	8,370	100		2,506,636	4,445,000	1.77	1,105	351	429	349	2,234	228	4.92
Wise	3,760,878	36,235	21,341	360,893	4,179,347	6,714,000	1.61	2,396	637	915	556	4,504	202	4.59
Other counties (Pulaski and Scott)	69,490	692	2,640		72,822	153,000	2.10	68	18	20	36	142	209	2.45
Total, 1930	10,414,384	96,153	35,947	360,893	10,907,377	17,520,000	1.61	6,422	1,691	1,857	1,739	11,709	200	4.66
Total, 1929	12,119,712	92,192	41,244	495,158	12,748,306	20,942,000	1.64	6,509	1,714	1,982	1,848	12,053	249	4.24
WASHINGTON														
King	477,029	88,938	2,550		568,517	$1,711,000	$3.01	406	74	147	117	744	235	3.25
Kittitas	910,812	19,644	18,592		949,048	3,237,000	3.41	738	109	70	133	1,050	181	4.99
Lewis	61,186	25,601	2,827		89,614	231,000	2.58	102	15	16	29	162	167	3.31
Pierce	242,836	4,154	1,616	15,928	264,534	1,032,000	3.90	195	44	159	72	470	222	2.53
Thurston and Whatcom	397,152	24,665	8,398		430,215	1,228,000	2.85	240	47	18	70	375	207	5.55
Total, 1930	2,089,015	163,002	33,983	15,928	2,301,928	7,439,000	3.23	1,681	289	410	421	2,801	205	4.01
Total, 1929	2,299,619	153,472	33,342	34,894	2,521,327	8,647,000	3.43	1,810	333	346	457	2,946	227	3.77

WEST VIRGINIA

Barbour	1, 605, 516	22, 558	1, 719	----------	1, 629, 793	$1, 838, 000	$1. 13	1, 224	178	166	149	1, 717	150	6. 31
Boone	3, 052, 313	13, 569	5, 406	----------	3, 071, 288	4, 615, 000	1. 50	1, 726	417	338	371	2, 852	200	5. 38
Braxton	95, 666	25, 781	1, 770	----------	123, 217	152, 000	1. 23	107	17	13	20	157	229	3. 43
Brooke	805, 651	782, 685	----------	----------	1, 588, 336	2, 545, 000	1. 60	1, 096	183	78	147	1, 504	187	5. 65
Clay	705, 741	14, 976	11, 101	----------	731, 818	1, 011, 000	1. 38	446	101	56	104	707	242	4. 27
Fayette	11, 251, 951	113, 712	39, 339	471, 820	11, 876, 822	21, 333, 000	1. 80	7, 122	1, 929	1, 442	1, 590	12, 083	218	4. 51
Gilmer	6, 320	4, 856	----------	----------	11, 176	15, 000	1. 34	15	2	5	5	27	99	4. 18
Greenbrier	2, 026, 909	20, 890	6, 118	----------	2, 053, 917	3, 105, 000	1. 51	928	325	297	224	1, 774	235	4. 94
Hancock	----------	22, 467	40	----------	22, 507	50, 000	2. 22	36	5	4	5	50	162	2. 78
Harrison	4, 981, 620	219, 504	730	----------	5, 201, 854	6, 008, 000	1. 15	2, 699	642	389	496	4, 226	181	6. 78
Kanawha	6, 206, 188	99, 129	9, 196	----------	6, 314, 513	8, 953, 000	1. 42	3, 986	786	578	593	5, 943	190	5. 59
Lincoln	60, 393	1, 350	550	----------	62, 293	65, 000	1. 04	72	13	32	14	131	139	3. 41
Logan	17, 664, 784	117, 596	7, 024	----------	17, 789, 404	22, 641, 000	1. 27	6, 494	1, 548	1, 440	1, 726	11, 208	206	7. 69
McDowell	20, 338, 999	253, 618	148, 109	101, 790	20, 842, 516	35, 376, 000	1. 70	9, 553	3, 343	3, 194	3, 431	19, 521	190	5. 62
Marion	7, 342, 717	69, 840	43, 101	----------	7, 455, 658	10, 466, 000	1. 40	3, 439	755	966	634	5, 794	181	7. 11
Marshall	995, 328	277, 263	10, 836	----------	1, 283, 427	1, 971, 000	1. 54	1, 179	131	144	138	1, 592	167	4. 83
Mason	8, 213	40, 791	2, 130	----------	51, 134	81, 000	1. 58	52	9	8	12	81	165	3. 82
Mercer	3, 908, 747	46, 227	5, 300	21, 268	3, 981, 542	6, 462, 000	1. 62	1, 828	620	334	768	3, 550	234	4. 79
Mineral	254, 288	15, 993	----------	----------	270, 281	437, 000	1. 62	317	30	33	64	444	184	3. 31
Mingo	5, 313, 285	44, 421	3, 485	----------	5, 361, 191	6, 841, 000	1. 28	2, 253	753	680	644	4, 330	209	5. 93
Monongalia	7, 157, 801	175, 103	145	----------	7, 333, 049	7, 565, 000	1. 03	3, 645	697	633	635	5, 610	216	6. 06
Nicholas	109, 297	4, 281	5, 622	----------	119, 200	253, 000	2. 12	122	21	19	30	192	191	3. 26
Ohio	2, 026, 611	184, 967	8, 442	----------	2, 220, 020	2, 847, 000	1. 28	1, 527	163	201	206	2, 097	241	4. 39
Preston	1, 466, 368	17, 162	7, 993	108, 734	1, 600, 257	2, 461, 000	1. 54	1, 375	233	176	218	2, 002	189	4. 24
Putnam	354, 771	3, 494	----------	----------	358, 265	717, 000	2. 00	358	48	46	99	551	173	3. 75
Raleigh	14, 397, 449	126, 155	69, 864	----------	14, 593, 468	25, 403, 000	1. 74	6, 487	2, 224	1, 717	1, 802	12, 230	232	5. 14
Randolph	374, 626	16, 045	1, 862	----------	392, 533	501, 000	1. 28	339	66	41	66	512	140	5. 48
Taylor	1, 177, 473	21, 511	----------	----------	1, 198, 984	1, 503, 000	1. 25	708	140	55	93	996	207	5. 82
Tucker	866, 012	7, 923	42, 685	2, 133	918, 753	1, 610, 000	1. 75	639	137	101	97	974	205	4. 60
Upshur	254, 418	10, 467	1, 959	----------	266, 844	281, 000	1. 05	175	48	27	33	283	198	4. 76
Webster	415, 122	20, 487	3, 847	----------	439, 456	713, 000	1. 62	407	113	39	85	644	219	3. 11
Wyoming	2, 101, 069	17, 971	13, 632	----------	2, 132, 672	3, 689, 000	1. 73	874	364	319	299	1, 856	227	5. 07
Other counties (Grant, Lewis, and Wayne)	155, 127	10, 800	10, 523	----------	176, 450	214, 000	1. 21	203	48	36	63	350	132	3. 81
Total, 1930	117, 480, 773	2, 823, 592	462, 528	705, 745	121, 472, 638	181, 722, 000	1. 50	61, 431	16, 089	13, 607	14, 861	105, 988	204	5. 61
Total, 1929	134, 241, 631	2, 946, 830	497, 087	833, 307	138, 518, 855	215, 110, 000	1. 55	59, 324	15, 984	14, 278	15, 356	104, 942	247	5. 34

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[7] The calculated output per man per day is affected by the practice of men going into certain mines to shoot and load coal on days when the tipples and mines as a whole are not in operation

TABLE 82.—*Production, value, men employed, days worked, and output per man per day at bituminous-coal mines in specified States and counties in 1930*—Continued

WYOMING

County	Net tons					Value		Number of employees					Average number of days worked	Average tons per man per day
								Underground						
	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for power and heat	Made into coke at mines	Total quantity	Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total		
Big Horn and Park	----------	2, 780	----------	----------	2, 780	$13, 000	$4. 68	4	1	1	2	8	241	1. 44
Campbell and Converse	65, 882	11, 127	8, 028	----------	85, 037	92, 000	1. 08	7	1	1	25	34	125	[3] 20. 03
Carbon	465, 847	9, 239	16, 426	----------	491, 512	1, 255, 000	2. 55	130	48	35	79	292	189	[3] 8. 89
Hot Springs	352, 582	8, 261	33, 662	----------	394, 505	1, 359, 000	3. 44	398	111	59	99	667	153	3. 85
Johnson	----------	14, 608	568	----------	15, 176	56, 000	3. 69	14	1	1	5	21	167	4. 32
Lincoln	768, 136	7, 292	37, 981	----------	813, 409	2, 160, 000	2. 66	574	96	64	144	878	181	5. 12
Sheridan	677, 599	26, 575	20, 394	----------	724, 568	1, 389, 000	1. 92	195	70	35	85	385	144	[3] 13. 07
Sweetwater	3, 399, 154	30, 641	66, 494	----------	3, 496, 289	8, 646, 000	2. 47	1, 649	416	358	444	2, 867	206	5. 93
Other counties (Fremont, Teton, and Uinta)	49, 928	9, 780	5, 149	----------	64, 857	163, 000	2. 51	36	6	5	17	64	161	6. 28
Total, 1930	5, 779, 128	120, 303	188, 702	----------	6, 088, 133	15, 133, 000	2. 49	3, 007	750	559	900	5, 216	188	6. 20
Total, 1929	6, 385, 615	131, 578	187, 597	----------	6, 704, 790	17, 052, 000	2. 54	2, 948	629	508	754	4, 839	230	6. 02

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[3] Much of the output is obtained from strip pits or by the use of loading machines, in which types of operations the production per man is large.

COAL PRODUCED AND CONSUMED IN ALASKA

TABLE 83.—*Coal produced and consumed in Alaska, 1921–1930*

Year	Produced in Alaska, chiefly subbituminous and lignite [1]		Imported from States, chiefly bituminous coal from Washington [2] (net tons)	Imported from foreign countries, chiefly bituminous coal from British Columbia [2] (net tons)	Total coal consumed (net tons)
	Net tons	Value			
1921	76,817	$496,394	24,278	33,776	134,871
1922	79,275	430,639	28,457	34,251	141,983
1923	119,826	755,469	34,082	43,205	197,113
1924	99,663	559,980	40,161	41,980	181,804
1925	82,868	404,617	37,324	57,230	177,422
1926	87,300	459,000	35,620	34,254	157,174
1927	104,300	548,000	[3] 39,437	30,492	174,229
1928	126,100	662,000	[3] 39,408	[3] 32,518	[3] 198,026
1929	[3] 100,600	528,000	36,693	27,073	[3] 164,366
1930	120,100	631,000	37,128	23,892	181,120

[1] Compiled by the Alaska branch of the U. S. Geological Survey.
[2] Compiled from records of the Bureau of Foreign and Domestic Commerce.
[3] Revised figures.

DETAILED STATISTICS OF ANTHRACITE AND SEMIANTHRACITE OUTSIDE OF PENNSYLVANIA

Need of separate figures.—Tables 84 to 86 analyze the production of anthracite and semianthracite from fields outside of Pennsylvania. As already pointed out (p. 619) these coals have no direct connection with the close-knit Pennsylvania anthracite industry. For statistical purposes they are generally included with the bituminous-coal industry, and they are so included in the primary tables of this report. The producers of these coals, however, are building up a specialized trade of their own. Their product differs from bituminous coal and is especially adapted to household use. It has become an important element in the domestic fuel supply of many communities, and its rapid growth has been an interesting feature of the domestic market since the war. To serve those interested in this development a special study of the supply and distribution of hard coal from mines outside of Pennsylvania was published in Coal in 1928, to which the reader is referred.[15] Statistics for 1930 are given in the following tables.

Coals included.—No attempt is made here to set up or lend authority to a particular system of classifying coals. Such procedure would be especially inappropriate at present because the task of classifying coals is lengthy and difficult and because the entire subject is now being considered by a sectional committee on classification of coal, under the sponsorship of the American Society of Testing Materials and the rules of the American Standards Association. Pending the final decision of the committee, the classification in most general use is that adopted by the United States Geological Survey, and the coals here included are those defined by the survey as anthracite and semianthracite. According to the survey, anthracite is defined as "hard coal having a fuel ratio (fixed carbon divided by the volatile matter) of not more than 50 or 60 and not less than 10," while the fuel ratio for semianthracite (with some modifications) ranges from 6 to 10. Aside from the mines of eastern Pennsylvania, such coals are commercially produced in the Crested Butte field of Colorado, the Los Cerrillos field of New Mexico, the Spadra and Russellville districts of Arkansas,[16] and that portion of the Valley coal fields of Virginia lying in Montgomery and Pulaski Counties.[17] Some of these coals have been classified by the Geological Survey as anthracite and some as semianthracite. In this connection it should be noted that the term semianthracite, though sanctioned by long usage, is unfortunate, because many persons might understand it to imply a product resembling bituminous coal and necessarily inferior to anthracite. Observers are agreed that semianthracite as defined by the Geological Survey differs sharply from bituminous coal and closely resembles anthracite. Furthermore, the slightly higher volatile content (or slightly lower fuel ratio), characteristic of semianthracite, does not necessarily impair the market value of a coal. On the contrary, the Lykens Valley coals of Pennsylvania, which have a volatile content from 2 to 5 per cent higher than most Pennsylvania anthracites, have long been recognized in the trade as commanding a premium over and above the price obtained for the usual Pennsylvania anthracite.

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[15] Tryon, F. G., Kiessling, O. E., and Mann, L., Coal: Mineral Resources of the United States, 1928, Bureau of Mines, Part II, pp. 557–569. See also Kiessling, O. E., Hard Coals Outside of Pennsylvania Make Consistent Gains: Coal Age, January, 1930, pp. 29–32.

On the commercial market the coals in question are known by characteristic trade names. Thus, the Virginia coal is sold as "Great Valley (or Virginia) anthracite," the Spadra and Russellville coals as "Arkansas anthracite," and the hard coals from Colorado and New Mexico as "Colorado anthracite," and "New Mexico (or Cerrillos) anthracite," respectively. For convenience, the group as a whole is referred to in this report as "hard coal outside of Pennsylvania," to distinguish it from the product of the Pennsylvania anthracite industry.

TABLE 84.—*Production and average value per ton of hard coal mined outside of Pennsylvania, 1913–1930*

Year	Production (net tons)			Average value per ton		
	Virginia	Arkansas, Colorado, and New Mexico	Total	Virginia	Arkansas, Colorado, and New Mexico	Total
1913	54, 579	308, 745	363, 324	$1. 54	$2. 76	$2. 58
1914	45, 151	300, 927	346, 078	1. 98	2. 50	2. 43
1915	51, 141	325, 255	376, 396	2. 16	2. 95	2. 84
1916	109, 543	415, 699	525, 242	1. 69	2. 78	2. 55
1917	127, 836	446, 337	574, 173	2. 71	3. 73	3. 50
1918	127, 448	441, 556	569, 004	3. 21	5. 13	4. 70
1919	105, 753	372, 258	478, 011	3. 11	5. 42	4. 91
1920	163, 728	424, 403	588, 131	3. 88	6. 06	5. 45
1921	85, 161	[a] 329, 184	[a] 414, 345	4. 08	5. 75	5. 40
1922	114, 111	208, 314	322, 425	4. 49	6. 44	5. 75
1923	213, 659	412, 021	625, 680	4. 82	5. 61	5. 34
1924	186, 084	518, 429	704, 513	3. 68	5. 06	4. 70
1925	266, 657	519, 937	786, 594	3. 75	4. 75	4. 41
1926	263, 823	579, 302	843, 125	4. 07	4. 80	4. 57
1927	158, 828	493, 041	651, 869	2. 83	4. 99	4. 46
1928	171, 896	540, 510	712, 406	2. 78	4. 64	4. 19
1929	268, 955	573, 358	842, 313	2. 53	4. 45	3. 84
1930	237, 032	471, 189	708, 221	2. 52	4. 57	3. 89

[a] Includes a small tonnage of bituminous coal from a different seam for 1 mine in Colorado.

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[16] Campbell, M. R., and others, The Coal Fields of the United States: U. S. Geol. Survey Prof. Paper 100–A, 1922, pp. 27–28, 30.

[17] Campbell, M. R., and others, The Valley Coal Fields of Virginia: Virginia Geol. Survey Bull. 25, prepared in cooperation with the U. S. Geol. Survey, Charlottesville, Va., 1925, pp. 115, 126.

Trend of production.—The production of hard coal outside of Pennsylvania has been increasing rapidly. A peak was reached in 1926 caused by a shortage of domestic fuel brought on by the great strike in the anthracite fields of Pennsylvania. But in 1929 the output came within a few hundred tons of equaling the maximum, although in that year there was no interruption in the domestic fuel supply. In 1930 production declined, as it did everywhere, but still remained almost double the amount produced in 1913, the total output for the year being 708,221 tons.

Figure 50 illustrates the growth that has featured this branch of the coal industry. (See also Table 85.) To facilitate comparison the annual production of bituminous coal, Pennsylvania anthracite, and other hard coal are all reduced to index numbers, the production in 1913 being taken as 100. It will be noted that since the war a pronounced decline is shown in the production of Pennsylvania anthracite and that the output of bituminous coal has barely held its own.

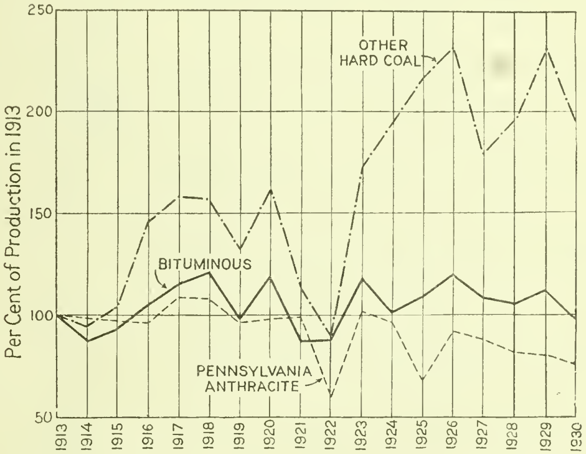

FIGURE 50.—Relative rates of growth of bituminous coal and of Pennsylvania anthracite and other hard coal in the United States. Production data for 1913 are represented by the number 100, and the figures for all other years are expressed as percentages of the 1913 rate

On the other hand, the production of other hard coals in 1930 stood 95 per cent above the 1913 level in spite of the depression.

TABLE 85.—*Relative rates of growth of bituminous coal and of Pennsylvania anthracite and all other hard coal, 1913–1930*

The figures for the year 1913 are represented by the number 100, and the figures for all other years are expressed as percentages at the 1913 rate]

Year	Bituminous coal	Pennsylvania anthracite	All other anthracite and semianthracite	Year	Bituminous coal	Pennsylvania anthracite	All other anthracite and semianthracite
1913	100	100	100	1922	88	60	89
1914	88	99	95	1923	118	102	172
1915	93	97	104	1924	101	96	194
1916	105	96	145	1925	109	68	217
1917	115	109	158	1926	120	92	232
1918	121	108	157	1927	108	88	179
1919	97	96	132	1928	105	82	196
1920	119	98	162	1929	112	81	232
1921	87	99	114	1930	98	76	195

Details of operations in 1930.—The outstanding developments in the hard-coal industry outside of Pennsylvania in 1930 are given in Table 86. From this table it will be seen that the number of men employed was slightly higher than in 1929 but that the working time was not as steady. The total value of the product in 1930 was $2,753,000, or an average of $3.89 per ton, which represents a gain of 5 cents a ton over the average sales realization in 1929. This increase is especially significant in view of the general downward trend of prices that occurred in many other producing fields. A small increase is also reported in the output per man per day, the average in 1930 being 2.20 tons as against 2.12 tons in 1929.

TABLE 86.—*Production, value, men employed, days worked, and output per man per day at the principal hard-coal mines outside of Pennsylvania in 1926–1930*

State	Net tons				Value		Number of employees					Average number of days worked	Average tons per man per day
							Underground						
	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for power and heat	Total quantity	Total	Average per ton	Miners, loaders, and shot firers	Haulage and track	All others	Surface	Total		
1926													
Virginia	244,507	13,822	5,494	263,823	$1,072,556	$4.07	198	30	55	121	404	256	2.55
Arkansas, Colorado, and New Mexico	555,261	10,954	13,087	579,302	2,778,892	4.80	880	96	222	405	1,603	148	2.44
	799,768	24,776	18,581	843,125	3,851,448	4.57	1,078	126	277	526	2,007	170	2.47
1927													
Virginia	145,474	9,579	3,775	158,828	449,059	2.83	246	48	33	100	427	132	2.82
Arkansas, Colorado, and New Mexico	479,912	4,665	8,464	493,041	2,459,616	4.99	916	136	275	328	1,655	129	2.31
	625,386	14,244	12,239	651,869	2,908,675	4.46	1,162	184	308	428	2,082	130	2.41
1928													
Virginia	160,558	7,724	3,614	171,896	477,187	2.78	356	49	33	112	550	128	2.45
Arkansas, Colorado, and New Mexico	522,490	5,749	12,271	540,510	2,506,791	4.64	1,175	170	205	353	1,903	129	2.20
	683,048	13,473	15,885	712,406	2,983,978	4.19	1,531	219	238	465	2,453	129	2.26
1929													
Virginia	258,151	6,197	4,607	268,955	681,000	2.53	281	53	78	142	554	187	2.60
Arkansas, Colorado, and New Mexico	557,471	6,972	8,915	573,358	2,552,000	4.45	1,177	157	148	336	1,818	162	1.95
	815,622	13,169	13,522	842,313	3,233,000	3.84	1,458	210	226	478	2,372	168	2.12
1930													
Virginia	226,943	6,894	3,195	237,032	598,000	2.52	307	58	61	99	525	180	2.51
Arkansas, Colorado, and New Mexico	460,400	4,761	6,028	471,189	2,155,000	4.57	1,232	227	158	321	1,938	118	2.07
	687,343	11,655	9,223	708,221	2,753,000	3.89	1,539	285	219	420	2,463	131	2.20

Distribution.—Like Pennsylvania anthracite, the hard coals of other States are distributed over a wide area. Colorado anthracite is shipped to some 16 States, moving as far north as Washington and Montana and as far east as Minnesota and Missouri. (See Coal in 1929, p. 823.) The normal marketing territory of "Arkansas anthracite" comprises the west half of the Mississippi Valley from the Gulf to Canada; but small tonnages also move east to the bordering States of Wisconsin, Illinois, Tennessee, and Mississippi. (See Coal in 1928, p. 566). The hard coal from the Great Valley of Virginia is also marketed over a broad area, but its movement is somewhat restricted by a sharply competitive environment. In 1929 about a third of the output was sold within Virginia, while approximately a quarter was marketed in the neighboring territory along the South Atlantic seaboard (including Maryland, West Virginia, and the District of Columbia). Nevertheless, a considerable tonnage of the Virginia product moves regularly to the States of the Middle West, and occasionally shipments are made to New England and Canada.

DETAILED STATISTICS OF PENNSYLVANIA ANTHRACITE

STATISTICAL SUMMARY

The salient developments in the anthracite industry during the past decade are summarized in Table 1A. The course of the industry is traced through the varying conditions of the past 10 years, starting after the bituminous-coal shortage of 1920, and including the strike of 1922 (the effects of which were apparent far into 1923), the great strike of 1925–26, the subsequent readjustments, and the general business depression of 1930. These changing conditions are clearly reflected in the statistical records of production, consumption, and distribution; of sales realization and sizes shipped; and of men employed, time worked, and time lost through strikes.

TABLE 1A.—*Salient statistics of the Pennsylvania anthracite industry, 1921–1930*

	1921	1922	1923	1924	1925
Production:					
Loaded at mines for shipment—					
Breakers.....gross tons..	67,981,416	37,906,503	69,288,426	67,592,270	46,615,423
Washeries.....do....	1,308,436	2,600,481	3,754,287	1,060,354	872,276
Dredges.....do....	264,711	566,854	384,999	318,357	519,776
Sold to local trade and used by employees.....gross tons..	2,511,206	2,123,393	2,900,314	2,717,803	2,575,515
Used at mines for power and heat.....gross tons..	8,714,098	5,626,896	7,010,375	6,817,343	4,610,893
Total.....do....	80,779,867	48,824,127	83,338,401	78,506,127	55,193,883
Value at breaker, washery, or dredge..	$452,305,000	$273,700,000	$506,787,000	$477,231,000	$327,665,000
Average sales realization per gross ton on breaker shipments:					
Stove.....	$7.67	$8.03	$8.56	$8.74	$8.79
Pea.....	$5.74	$5.92	$6.18	$5.60	$5.27
Total domestic.....	$7.39	$7.77	$8.23	$8.25	$8.30
Buckwheat No. 1.....	$3.43	$3.56	$3.48	$2.94	$2.49
Buckwheat No. 2.....	$2.27	$2.37	$2.23	$1.93	$1.84
Total steam.....	$2.75	$2.77	$2.64	$2.25	$2.00
All sizes.....	$6.27	$6.48	$6.77	$6.70	$6.59
Percentage by sizes in total breaker shipments:					
Broken.....per cent..	3.7	4.3	5.0	2.7	2.6
Egg.....do....	15.0	14.5	15.7	14.5	13.5
Stove.....do....	21.5	21.5	19.6	22.2	24.4
Chestnut.....do....	27.2	25.8	25.6	26.5	26.8
Pea.....do....	8.4	7.8	8.0	8.3	5.6
Steam sizes.....do....	24.2	26.1	26.1	25.8	27.1

TABLE 1A.—*Salient statistics of the Pennsylvania anthracite industry, 1921–1930*—Continued

	1921	1922	1923	1924	1925
Exports gross tons	4,176,000	2,366,000	4,545,000	3,587,000	2,838,000
Imports do	8,000	209,000	268,000	105,000	342,000
Consumption (calculated) do	73,170,000	50,713,000	77,602,000	72,069,000	57,197,000
Average number of days worked	271	151	268	274	182
Man-days lost on account of strikes and lockouts	823,279	19,623,026	2,629,418	1,143,630	15,269,506
Number of men on strike during year	52,117	142,442	135,585	71,273	147,928
Average number of men employed	159,499	156,849	157,743	160,009	160,312
Output per man per day gross tons	1.87	2.06	1.97	1.79	1.89
Output per man per year do	506	312	529	491	345
Quantity cut by machines do	874,237	448,922	1,079,055	1,271,325	840,347
Quantity produced by stripping do	1,810,527	847,987	2,020,623	1,665,783	1,409,355
Distribution:					
Total receipts in New England[1] net tons	11,374,000	6,471,000	12,185,000	10,611,000	8,280,000
Exports to Canada do	4,519,216	2,572,450	4,988,837	3,927,999	3,096,815
Loaded into vessels at Lake Erie[2] net tons	4,265,714	1,381,946	3,512,079	3,094,088	1,793,516
Receipts at Duluth-Superior[3] net tons	1,844,642	566,362	1,419,984	1,289,994	790,132

	1926		1927	1928	1929	1930	
Production:							
Loaded at mines for shipment—							
Breakers gross tons	65,826,189		61,129,944	57,635,506	57,324,911	53,400,296	
Washeries do	1,067,810		1,317,623	1,245,192	684,186	915,809	
Dredges do	354,947		494,653	483,231	289,634	328,589	
Sold to local trade and used by employees gross tons	2,399,474		2,720,330	2,843,594	2,886,628	2,807,530	
Used at mines for power and heat gross tons	5,742,162		5,851,346	5,067,539	4,732,672	4,498,523	
Total do	75,390,582		71,513,896	67,275,062	65,918,031	61,950,747	
Value at breaker, washery, or dredge	$474,164,000		$420,942,000	$393,638,000	$385,643,000	$354,574,000	
	Old method[4]	New method[4]				1929[5] basis	Actual[5] reports
Average sales realization per gross ton on breaker shipments:							
Stove	$9.09	$9.14	$8.86	$8.72	$8.72	$8.66	$8.60
Pea	$5.98	$5.98	$5.90	$5.00	$4.66	$4.62	$4.69
Total domestic	$8.60	$8.66	$8.33	$8.09	$8.00	$7.93	$7.90
Buckwheat No. 1	$2.39	$2.52	[6] $2.56	[6] $2.75	[6] $2.63	$2.75	$2.78
Buckwheat No. 2	$1.78	$1.78	$1.78	$1.85	$1.77	$1.69	$1.69
Total steam	$1.88	$1.94	$1.98	$2.12	$2.04	$2.07	$2.09
All sizes	$6.78	$6.84	$6.50	$6.38	$6.30	$6.20	$6.19
Percentage by sizes in total breaker shipments:							
Broken per cent	1.6		1.0	0.7	0.6	0.5	
Egg do	13.5		11.7	11.7	11.4	10.5	
Stove do	25.1		25.9	25.6	25.8	25.7	
Chestnut do	27.1		26.4	25.4	25.6	25.7	
Pea do	5.5		6.2	7.8	8.1	8.2	
Steam sizes do	27.2		28.8	28.8	28.5	29.4	
Exports gross tons	3,598,000		2,969,000	2,979,000	3,041,000	2,278,000	
Imports do	727,000		106,000	343,000	435,000	603,000	
Consumption (calculated) do	68,947,000		66,671,000	65,759,000	63,801,000	60,382,000	

[1] From records of the Massachusetts Department of Labor and Industries, Division on the Necessaries of Life.

[2] From records of the Ore and Coal Exchange.

[3] From records of the United States Engineer Office, Duluth, Minn.

[4] The figures under the heading "Old method" are computed so as to be exactly comparable with the earlier years. Those under the heading "New method" are based on a more accurate system of estimating the values of one company which reported quantities but not values and (except for buckwheat No. 1) are strictly comparable with the figures for 1927 and thereafter. (See Coal in 1926, p. 576, and Coal in 1927, pp. 502-503.)

[5] The figures under the heading "1929 basis" are so calculated as to be exactly comparable with 1929. Those under the heading "Actual reports" are affected by a change in status of a company that formerly sold its output direct and in 1930 was merged with a larger company selling through a separately incorporated sales company.

[6] The averages for buckwheat No. 1 in 1927–1929 were computed according to the "Old method" and are comparable with the figure of $2.39 in 1926 and with those given for 1918 to 1925. (See Coal in 1927, pp. 502–503.)

TABLE 1A.—*Salient statistics of the Pennsylvania anthracite industry, 1921–1930*—Continued

	1926	1927	1928	1929	1930
Average number of days worked	244	225	217	225	208
Man-days lost on account of strikes and lockouts	5,990,477	159,242	400,682	272,511	112,398
Number of men on strike during year	145,376	20,478	36,128	39,777	18,202
Average number of men employed	165,386	165,259	160,681	151,501	150,804
Output per man per day..gross tons	1.87	1.92	1.93	1.93	1.97
Output per man per year.......do	456	433	419	435	411
Quantity cut by machines.......do	831,183	1,046,329	1,151,615	1,035,634	1,259,038
Quantity produced by stripping.do	2,144,068	1,922,461	2,163,325	1,706,934	2,264,543
Distribution:					
Total receipts in New England [1] net tons	10,608,000	9,145,000	9,376,000	9,039,000	8,389,000
Exports to Canada.......do	3,941,718	3,238,564	3,296,487	3,376,303	2,532,135
Loaded into vessels at Lake Erie [2] net tons	2,857,917	1,918,389	1,420,882	1,321,328	1,232,137
Receipts at Duluth-Superior [3] net tons	1,272,973	981,194	652,095	401,249	460,708

[1] From records of the Massachusetts Department of Labor and Industries, Division on the Necessaries of Life.

[2] From records of the Ore and Coal Exchange.

[3] From records of the United States Engineer Office, Duluth, Minn.

ANTHRACITE SITUATION

Ever since 1921 the general trend in anthracite production has been downward. (The abnormal strike years of 1922 and 1925–26 are, of course, eliminated from consideration in reviewing the long-term period.) The demand for domestic sizes has been contracting. The aggressive attack on hard-coal markets by other fuels has contributed to the downward tendency. The effect of this general situation has been to unite the anthracite producers in a determined effort to regain their position in the fuel market.

INCURSION OF COMPETITIVE FUELS

A very substantial factor in reduced demand for anthracite can be found in the increased use of other fuels. Important competitors of domestic anthracite for househeating are fuel oil, by-product coke, manufactured gas, fuel briquets, imported anthracite, and raw bituminous coal. In view of the analyses given on this general topic in preceding reports (see p. 573, Coal in 1928; and pp. 477 to 481, Coal in 1927), it will suffice to indicate briefly that the use of most of the competitive fuels in 1930 was greater than in 1929, with the exception of fuel briquets and gas-house coke.

Oil.—According to E. B. Swanson, of the Bureau of Mines, the total consumption of oil for domestic heating in 1929 amounted to 19,581,000 barrels and in 1930 to 25,359,000 barrels. This represented a gain of 29.5 per cent over the previous year, and 405.1 per cent over 1924. In addition, 17,344,000 barrels were used for commercial heating (apartment houses, hotels, schools, and hospitals).

Coke.—The total consumption of by-product coke for househeating purposes in 1930 was 7,886,432 tons, as compared with 7,376,320 tons in 1929 and only 2,812,771 tons in 1924.

Figures showing the consumption of coke by States or geographical districts are not available for 1930. Coke may be said to be a natural competitor of anthracite, being more nearly a comparable fuel in appearance and action. The 1929 coke production shows a sectional distribution that bears out this statement. New England consumed 8.4 per cent of the total, the Middle Atlantic States 25.3 per cent, the East North Central States 52.7 per cent, and the West North Central States 9.4 per cent. The rest of the country consumed only 4.2 per cent of the total. The northeastern quarter of our country in which the bulk of the coke was consumed is also anthracite-consuming territory.

Manufactured gas.—According to the Census of Manufactures, 285,552,000,000 cubic feet of manufactured gas were consumed for domestic purposes in 1929. The American Gas Association reports 29,500,000,000 cubic feet of manufactured gas were sold for house heating in 1930.

Fuel briquets.—Fuel briquets are a relatively small item, and both the imports and the production in this country decreased during 1930. The production decreased from 1,212,415 tons in 1929 to 1,028,865 in 1930, or 15.1 per cent, but the 1930 total was larger than that of any year previous to 1929. Briquets imported in 1930 amounted to 73,418 tons as against 89,458 tons in 1929.

Anthracite imports.—Anthracite imports, principally from the United Kingdom, have been gaining steadily since 1927 and reached 674,812 tons in 1930, a gain 38.5 per cent over 1929. This amount represented the largest tonnage imported in any year during the past decade, with the exception of the strike period of 1926. (See "Competitive fuels in New England," discussed below.)

Bituminous.—The tonnage consumption of bituminous coal for domestic purposes is not available. In the absence of accurate figures the total consumption of bituminous coal for domestic fuel is believed to be a variable quantity. The Massachusetts State Division on the Necessaries of Life estimates a substantial increase in that State, but this increase is interesting mainly as an indication of considerable competition with anthracite in some sections, of which New England is one.

Natural gas.—Natural gas is a decidedly influential competitor that is becoming aggressive in the northwestern section of the Middle Atlantic territory, in northern Ohio and southern Michigan, and in the Chicago and Minneapolis territories. The natural gas consumed in the entire United States for domestic use in 1929 is stated as 359,853,000,000 cubic feet, and in 1930 it reached an estimated total of 376,407,000,000 cubic feet.

Competitive fuels in New England.—Accurate information is not available by geographical districts to show where competitive fuels are making the greatest inroads.

Certain approximate statistics of fuel consumption are, however, available for Massachusetts. New England has always been a stronghold of Pennsylvania anthracite. Throughout anthracite history shipments have been repeatedly interrupted. Most often these interruptions were caused by strikes or lockouts in the anthracite region. During the World War regulation of fuel allotments forced the substitution of other fuels, either in part or in full, upon many New England consumers. Throughout the anthracite strikes of 1922 and 1925–26 this important section again was deprived of its full anthracite tonnage. Largely as a result of this enforced spasmodic dependence on competitive fuels, which has impressed anthracite consumers with a feeling of some uncertainty, New England has become one of the most important battle grounds of the domestic heating fuels. It is the scene of particularly keen competition among anthracite, coke, oil, gas, and even bituminous coal.

The Massachusetts Department of Labor and Industries, through its Division on the Necessaries of Life, furnishes approximate figures for Massachusetts covering the coal year, from April to April. In this coal-year period, 1929–30, approximately 4,703,000 tons of domestic sizes of anthracite were consumed, while in the coal year 1930–31 only 4,183,000 net tons were consumed. At the same time, buckwheat increased from 160,000 to 175,000 tons. Thus, the net decrease for anthracite, domestic and buckwheat sizes, was 505,000 tons. At the same time bituminous coal for domestic purposes jumped from 500,000 to 800,000 net tons, coke from 640,000 to 895,000 tons, and oil from 100,000,000 to 140,000,000 gallons.

Increasing imports of Russian anthracite aroused some concern during 1930. From 113,170 gross tons in 1929, they rose to 172,438 in 1930. The great bulk of imported Russian anthracite reaches New England, which, as stated before, has always been a Pennsylvania anthracite stronghold. It is natural that the appearance of imported substitutes, particularly the very comparable Russian anthracite at competitive prices should arouse apprehension in the industry.

Manufactured gas.—The number of gas installations for home heating, although not a measure of actual gas consumption, indicates growing competition. In Massachusetts the gas installations for the latest coal year were 5,049, as against 4,344 for the previous year. In Washington, D. C., an active campaign by the gas companies resulted in a number of installations for space heating during the closing months of 1930. Practically all these installations displaced anthracite.

Comparison of competitive fuel consumption.—The data on consumption of anthracite and competitive fuels have been assembled in Table 2A. It will be noted that while the anthracite industry regained the largest part of its tonnage after the strike of 1925–26 the declining production and shipments of hard coal and the increasing sales of competitive fuels clearly indicate that anthracite has been subjected to losses of trade that have not yet been recovered.

Table 2A.—*Total supplies of fuels used for domestic purposes in the United States, 1924–1930*

[The figures for 1925 and 1926 were affected by the great strike of the anthracite miners, which lasted from Sept. 1, 1925, to Feb. 18, 1926]

	1924	1925	1926	1927	1928	1929	1930
Solid fuels (net tons)							
Pennsylvania anthracite production:							
Shipments of domestic sizes	56,576,296	38,305,222	54,096,437	48,999,058	46,218,403	46,141,575	42,508,088
Shipments of buckwheat No. 1 [1]	9,510,508	6,631,604	8,581,966	9,062,977	8,769,923	8,597,053	8,570,032
Shipments of smaller steam sizes	11,160,695	8,831,546	12,640,417	12,433,251	11,499,274	10,555,951	10,123,937
Local sales	3,043,939	2,884,577	2,687,411	3,046,770	3,184,825	3,233,023	3,144,434
Total commercial production	80,291,438	56,652,949	78,006,231	73,542,056	69,672,425	68,527,602	64,346,491
Anthracite exported	4,017,785	3,179,006	4,029,683	3,325,507	3,336,272	3,406,369	2,551,659
Anthracite imported, chiefly from United Kingdom	117,951	382,894	813,956	119,030	384,707	487,172	674,812
Fuel briquets produced	580,470	839,370	995,332	970,468	947,423	1,212,415	1,028,865
Fuel briquets imported	38	6,758	123,593	60,601	71,485	89,458	73,418
By-product coke sold for domestic use	2,812,771	4,085,068	5,056,568	4,702,529	6,254,382	7,376,320	7,886,432
Beehive coke sold for domestic use	139,886	392,698	386,045	111,103	78,338	134,703	141,391
Coke imported	82,833	201,579	284,548	168,859	147,701	119,724	132,674
Gas-house coke sold	[2] 1,400,000	1,368,704	[2] 1,400,000	1,484,268	[2] 1,450,000	1,400,000	[2] 1,300,000
Petroleum coke produced [3]	761,100	991,000	995,300	1,145,200	1,426,600	1,820,600	1,940,000
Anthracite and semianthracite produced outside of Pennsylvania	704,513	786,594	843,125	651,869	712,406	842,313	708,221
Bituminous coal for domestic use [4]	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Oil (barrels) [6]							
Oil used for heating houses	[7] 5,021,000	[7] 8,829,000	9,080,000	11,709,000	[7] 14,271,000	[7] 19,581,000	25,359,000
Oil used for heating offices, hotels, apartments, schools, hospitals, and buildings other than houses	(8)	[2] 12,100,000	13,874,000	15,751,000	16,427,000	[7] 17,820,000	17,344,000
Gas (million cubic feet)							
Natural gas consumed for domestic use	285,152	272,146	289,175	296,036	320,877	359,853	376,407
Manufactured gas sold for domestic purposes	(8)	(8)	(8)	[9] 281,044	(8)	[9] 285,552	(8)

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[1] A considerable part of the buckwheat No. 1 is used for domestic purposes.

[2] Partly estimated.

[3] How much petroleum coke was used for house fuel prior to 1928 is not known. For that year 235,000 tons were reported to have been consumed for domestic heating, according to E. B. Swanson in Economic Paper No. 9, Bureau of Mines.

[4] During the anthracite strike of 1925–26 about 17,000,000 tons of bituminous coal in addition to the normal consumption were used to replace anthracite.

[5] Between 56,000,000 and 77,000,000 tons a year.

[6] Based on surveys by E. B. Swanson, U. S. Bureau of Mines.

[7] Revised.

[8] Data not available.

[9] From Census of Manufactures.

DECLINE IN RETAIL PRICES

Reference has already been made to the decline in the mine price of anthracite during the past few years. (See p. 727, Table 1A.)

One would suppose that with a concentrated market, reduced production, improved preparation, better merchandising, and slightly decreased wholesale prices anthracite's competitive position would have been strengthened.

Anthracite production adjusts itself more sensitively to the demand than the vast majority of industries. There is no doubt that the quality and sizing standards have been greatly improved in recent years. Normally an industry in this position would occupy a strong price position.

It is necessary, however, to consider fully the retail price structure. Prices paid by the consumer are built upon a retailers' cost, composed of three items: (1) The mine price paid, (2) the freight rate from the mines to destination, and (3) the actual cost to the retailer of maintaining his storage, cleaning, and delivery equipment, plus his general overhead. Eight-dollar anthracite at the mines, therefore, may become 15-dollar anthracite in the consuming district. A 25-cent reduction in mine price is a more considerable item than the same 25 cents reflected in retail price. In other words, the 25-cent change on 15-dollar coal seems slight.

For that reason the lower mine realizations in 1930 and the reduced Pennsylvania tax charges can be said to have resulted in no radical change in retail prices.

Retail-price quotations at Baltimore, Boston, New York, and Chicago varied only slightly, except for summer discounts, during the period following the 1926 strike and until the spring of 1929.

An examination of Table 3A, based on figures from the Bureau of Labor Statistics, indicates retail reductions during 1929 in the prices of stove coal in New York and Boston. Following the usual practice, periodic summer increases left the New York average price 21 cents lower in the fall than it had been in March. In Boston there was a net drop of 25 cents a ton, and in Chicago the change simply reflected the 5-cent reduction in the Pennsylvania State tax. Baltimore showed a slightly lower average price in the fall than in April. In 1930 Baltimore maintained the 1929 base, and the Boston average restored the 1929 reduction of 25 cents. The average price per ton in New York had decreased 41 cents and in Chicago 45 cents by the end of 1930, as compared with the close of 1929.

Table 3A.—*Average retail prices of stove anthracite and of bituminous coal in representative cities, by months, 1926–1930, as reported by the Bureau of Labor Statistics*

[From Monthly Labor Review. All figures in net tons of 2,000 pounds except as noted. Prices represent sidewalk delivery. Grades of bituminous coal were not specified]

Month	Anthracite, white-ash stove				Bituminous coal		
	Baltimore	Boston	New York	Chicago	Chicago	Detroit	Norfolk
1926							
January	(1)	(1)	(1)	(1)	$9.48	$10.59	$10.52
February	(1)	(1)	(1)	(1)	9.34	10.53	10.52
March	$16.75	$18.00	$15.71	$16.89	8.99	10.69	10.16
April	16.00	16.00	14.75	16.86	8.39	10.45	9.34
May	16.00	16.00	14.75	16.84	8.12	9.33	8.46
June	16.00	16.00	14.75	16.84	8.13	9.24	8.41
July	16.00	16.25	14.75	16.88	8.27	9.30	8.52
August	16.00	16.25	14.75	16.88	8.32	9.25	8.52
September	16.00	16.25	14.75	16.90	8.91	9.90	9.09
October	16.08	16.40	14.75	16.91	9.06	10.39	9.66
November	16.00	16.50	14.75	17.00	10.15	11.61	10.39
December	16.00	16.50	14.75	17.00	10.34	11.05	10.25
1927							
January	16.00	16.50	14.75	17.00	9.85	10.34	9.68
February	16.00	16.50	14.75	17.00	9.64	10.22	9.73
March	16.00	16.50	14.54	17.00	9.31	9.78	9.71
April	15.25	15.75	13.75	16.25	8.89	9.57	8.27
May	15.25	15.75	13.83	16.25	8.98	9.41	8.27
June	15.50	15.75	14.08	16.50	9.12	9.28	8.57
July	15.75	16.00	14.08	16.70	9.09	9.18	8.55
August	15.75	16.00	14.08	16.70	9.16	9.21	8.55
September	16.00	16.00	14.38	16.95	9.32	9.38	8.80
October	16.00	16.25	14.38	16.94	9.30	9.38	9.07
November	16.00	16.25	14.75	16.95	9.29	9.35	9.07
December	16.00	16.25	14.75	16.95	9.17	9.31	9.07
1928							
January	16.00	16.25	14.25	16.95	9.21	9.31	9.05
February	16.00	16.25	14.75	16.95	9.21	9.31	9.09
March	16.00	16.25	14.75	16.95	9.21	9.33	9.05
April	15.17	15.50	14.25	16.95	9.20	9.23	9.05
May	15.00	15.50	14.25	16.00	8.18	9.15	8.55
June	15.25	15.50	14.46	16.25	8.30	8.99	8.55
July	15.25	15.50	14.50	16.25	8.35	9.13	8.55
August	15.25	15.75	14.50	16.25	8.58	9.13	8.55
September	15.75	15.75	14.71	16.50	8.72	8.98	8.50
October	16.00	16.00	14.75	16.75	9.15	9.05	8.55
November	16.00	16.25	14.75	16.90	9.15	9.19	9.07
December	16.00	16.25	14.79	16.90	9.10	9.31	9.07
1929							
January	16.00	16.25	14.79	16.80	8.20	8.33	7.88
February	16.00	16.25	14.75	16.90	8.20	8.30	7.88
March	16.00	16.25	14.79	16.90	8.20	8.27	7.81
April	16.00	16.25	13.83	16.85	8.27	8.30	7.81
May	13.50	15.25	13.83	16.40	7.61	8.30	7.88
June	13.50	15.25	14.08	16.41	7.62	8.31	7.81
July	14.00	15.80	14.13	16.55	7.74	8.23	7.81
August	14.00	15.85	14.25	16.65	7.88	8.31	7.81
September	14.25	15.95	14.33	16.63	8.22	8.39	7.81
October	14.25	16.00	14.54	16.85	8.42	8.46	7.38
November	14.25	16.00	14.54	16.85	8.45	8.39	7.25
December	14.25	16.00	14.58	16.85	8.47	8.39	7.25
1930							
January	14.25	16.00	14.63	16.85	8.53	8.39	7.25
February	14.25	16.25	14.58	16.85	8.41	8.32	7.25
March	14.25	16.25	14.58	16.85	8.41	8.09	7.25
April	14.25	16.25	14.58	16.85	8.52	8.05	7.25
May	13.50	15.25	13.21	16.38	7.58	8.05	7.13
June	13.58	15.35	13.21	16.38	7.69	8.00	6.75
July	14.00	15.50	13.58	16.38	7.78	8.09	7.38
August	14.00	15.75	13.63	16.38	8.06	8.18	7.38
September	14.25	16.25	14.04	16.38	8.08	8.18	7.38
October	14.25	16.25	14.08	16.38	8.09	8.00	7.38
November	14.25	16.25	14.17	16.38	8.09	7.96	7.38
December	14.25	16.25	14.17	16.40	8.09	7.82	7.38

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[1] Insufficient data.

IMPORTANT DISTRIBUTION CHANNELS

Anthracite has for more than 25 years been distributed through five principal agencies; however, the producer relationships of the respective agencies have from time to time undergone changes. The last detailed report was that of the United States Coal Commission covering distribution for the year 1921. According to that report the domestic sizes of anthracite, including pea coal, were distributed in the following manner:

	Domestic sizes, per cent
(1) Through selling agents, affiliated by ownership with the producing company	35. 76
(2) Selling agents, unaffiliated with producing company	17. 10
(3) Sales to independent wholesalers or jobbers and through unaffiliated agents on commission	19. 92
(4) Through sales department of producing company	24. 21
(5) Miscellaneous	3. 01

The Census of Mines and Quarries, prepared by the Bureau of the Census, shows that anthracite was distributed in 1929 through the same types of channels but in different proportions, as follows:

	All sizes, per cent
(1) Through selling agents, affiliated by ownership with the producing company	35
(2 and 3) Unaffiliated selling agents and independent wholesalers	35. 1
(4) Through sales department of producing company	28. 1
(5) Miscellaneous	1. 8

The 1921 and 1929 percentages are not strictly comparable, since the 1921 figures were for the domestic sizes only, while the 1929 Census of Mines and Quarries included all sizes.

The figures are of interest mainly in demonstrating that in spite of two major and several lesser changes during the 10-year period the distribution methods and, generally speaking, the business relationships concerned with production and distribution of anthracite have proved comparatively stable.

ANTHRACITE IN AN INTENSELY COMPETITIVE MARKET

Every factor in the production and distribution of anthracite has been keenly aware of the aggressive competition of other fuels, growing in intensity, especially in the last five years. Alert to the threat offered by the rapid development of economical and convenient devices for relieving the household consumer of work and uncertainty in burning anthracite the industry has been closely cooperating and rapidly preparing itself to enter competition on even terms with its strongest competitors.

The operators now realize that their first consideration must be the consumer's interest. They must first make the quality and sizing of their fuel uniform and dependable. They recognize also that they must produce it on as efficient a cost basis as possible.

Improvement and consolidation of producing plants.—Although from the standpoint of public news interest the education of retailers and the development of a real sales and service organization for anthracite are most interesting, no less important to its rehabilitation is the decided progress in the improvement of mining, loading, and preparation equipment.

The industry pursued its drive to concentrate preparation of anthracite in the most efficient breakers. Nine fewer breakers were operating in 1930 than in 1929.

Many additional shovels and high-capacity shaking conveyors and loaders were added during the year, according to news items in trade journals. Among the leaders in these improvements were the Price-Pancoast Coal Co., West End Coal Co., Pittston Co., Glen Alden Coal Co., George F. Lee Coal Co., Lehigh & Wilkes-Barre Coal Co., Hudson Coal Co., Lehigh Valley Coal Co., Jeddo-Highland Coal Co., and Madeira, Hill & Co.

New cleaning equipment was also added, notably at the Philadelphia & Reading Coal & Iron Co.'s new Locust Summit central breaker and the Hudson Coal Co.'s Powderly breaker.

Nineteen hydroseparators with a total capacity of nearly 1,000,000 tons annually were installed by five different operators.

Reference probably should be made to the operations of the Jonathan Coal Mining Co., whose dredges take coal from the creeks and rivers, reclaiming mostly buckwheat Nos. 3 and 4. This company is said to have a capacity of 600,000 tons annually and uses Wilfley, Deister-Overstrom, and James tables and one hydrotator for cleaning. A reduction in ash to a content of 12 to 20 per cent is claimed.

Anthracite Institute.—The industry's organization has been extended and consolidated through the inclusion of all the different services and activities under the Anthracite Institute. The bureau of information, the research laboratory, and the credit bureau have been referred to in Pennsylvania Anthracite in 1929 and their activities fully indicated. The year 1930 saw the effectiveness of each of these services intensified.

Maintenance of quality and size standards.—The anthracite bureau of information, a department of the Anthracite Institute, conducts the inspection service for the observance of preparation standards. Frequent inspections are made without notice to the colliery superintendents, and a report of each inspection is made to the bureau.

New standards of sizing, of oversize and undersize tolerances, and of permissible bone and slate content were adopted in 1928 and revised in August, 1930. These new size standards make no radical change from the standards of 1928 (see Pennsylvania Anthracite in 1928, p. 10, for table of standards). A slight leeway is allowed in chestnut size, so that a 15 per cent undersize is permissible when the test screen over which chestnut passes is a $^{12}/_{16}$-inch mesh, but only 10 per cent undersize is permitted when it is an $^{11}/_{16}$-inch mesh. Pea coal must now pass through a $^{12}/_{16}$-inch mesh, whereas the 1928 standard provided $^{11}/_{16}$-inch mesh. The other provisions of the new standards correspond with those of 1928. In all of its provisions the anthracite industry is following closely the consumer's interest along two lines: (1) The trends toward larger consumption of the smaller sizes and (2) reduction of permissible impurities and percentage of tolerance in sizing.

Anthracite preparation standards, round-mesh screens

[Adopted Aug. 8, 1930]

Size of coal	Testing-screen mesh	Maximum oversize over test mesh	Maximum undersize through test mesh	Maximum impurities permissible	
				Slate	Bone
	Inches	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Broken:					
Through	4 7/16	5		2	2
Over	3 7/16		15		
Egg:					
Through	3 7/16	5		2	3
Over	2 8/16		15		
Stove:					
Through	2 8/16	5		3	4
Over	1 18/32		15		
Nut:					
Through	1 18/32	3		4	5
Over	24/32 22/32		15 10		
Pea:					
Through	24/32	5		7½	7½
Over	16/32		10		
Buckwheat:					
Through	18/32	5			
Over	10/32				
Rice:					
Through	10/32				
Over	6/32				
Barley:					
Through	6/32				
Over	3/32				
Boiler:					
Through	10/32				
Over	3/32				

Violations of standards involve a recheck of the same colliery. Whereas these rechecks were not infrequent, often several a day, when the standards were first put into effect, the bureau reports that adherence to standards has become so scrupulous that the necessity for recheck is now remarkably infrequent. At the same time more exact standards are constantly under test, with a view to reducing the percentage of allowable impurities still further.

The importance of this progress toward the stabilization of quality and uniformity of sizing can not be overestimated. Uniform, dependable quality is the first essential to any merchandising campaign that expects a degree of success. The anthracite industry is now able to assure the consumer of standards upon which he can rely.

Research laboratory.—The year 1930 was marked by the opening of the new Anthracite Institute testing laboratory near Philadelphia. Here all types of anthracite-consuming devices are being tested and studied and their merit determined. The laboratory is equipped with necessary engineering and scientific devices and has inaugurated a system of putting its official mark of approval on equipment found to give efficient heating service. The results of the tests on different types of heating plants and different makes of furnaces are currently communicated to retail coal merchants through the Anthracite Institute Laboratory Bulletin.

Four problems were also being studied at Lehigh University, with the support of the Anthracite Institute. One study is to determine whether the constitution of anthracite is constant in each seam and different from seam to seam. The objects of this study are (1) correlation of the beds and (2) finding the relation of constitution to physical and chemical behavior. Another study, in the department of bacteriology, is to determine the comparative efficiencies of sand and fine anthracite in water purification, from both bacteriological and chemical standpoints. Incidentally, it was found that no living bacteria exist in anthracite. A third study concerns the specific-heat capacity of anthracite in comparison with that of other solid fuels. The fourth work is investigation of the benzenoid constitution of coal as shown by its oxidation with alkaline permanganate.

Anthracite Service.—This division of the Anthracite Institute, with headquarters in Philadelphia, has been engaged primarily in the education of retail distributors in up-to-date merchandising methods applicable to anthracite. Close working contact is maintained between the operators and the distributors with a view to cultivating the consumer's good will.

During 1930 the representatives of Anthracite Service responded to requests from retailers and worked on such requests directly with the consumer, in company with the retailer, as part of the educational plan. A statistical summary of these direct calls by agents of the service shows that during the year 1,115,955 tons of anthracite were "serviced." In the same manner 113,631 tons were gained for anthracite from competitive fuels. The annual tonnage of anthracite consumed by new buildings where competitive fuels were considered amounts to 103,515. Anthracite consumers using 111,630 tons annually, who seriously contemplated a change to another fuel, were convinced against making the change.

The above figures are important principally in their indications rather than in their size. Anthracite Service has no record of the tonnage represented by those who were prevented by retailers themselves, on their own initiative, from abandoning anthracite in favor of another fuel, of the tonnage that was successful in competition with other fuels on new building projects, or of that represented by new customers converted from other fuels. This total might conceivably be several times that in which Anthracite Service actually participated.

During 1930 the training school for retail dealers was developed into a series of 5-week classes, with a more comprehensive curriculum than previously. In the beginning these retailers' schools concerned themselves principally with meeting and overcoming the various complaints by removing the causes. Most of these causes were due to faulty heating plants or unintelligent use of the fuel. Beginning with 1930, however, these retailers' classes began thorough training, not only in the less technical aspects of production but also in the very technical aspects of anthracite's use in the various types of furnaces, for various types of buildings, and for special uses; they also gave complete schooling in up-to-date merchandising. The thoroughness with which the industry is attempting to educate itself and its dealers to meet the demands of serving the consuming public is of sufficient interest to justify reproduction of a typical curriculum here.

Anthracite Service school schedule

Day	Hour	First week	Second week	Third week	Fourth week	Fifth week
Monday	9 a. m. to 12 m.	Class organization and introductory talks on history and future of anthracite.	Daily quiz; lecture on heat loss from buildings.	Daily quiz; care and firing of boilers; fuel selection; problems.	Daily quiz; oil burners and fuel oil; problems.	Office record card filing systems.
	1 to 4:30 p. m.	Lecture and moving pictures on origin, mining, and preparation of anthracite; coal analysis and sizing.	Lecture on heat loss from buildings; problems on heat losses.	Demonstration on care and firing of boilers.	Demonstration on oil burners.	Dealer advertising and publicity.
Tuesday	9 a. m. to 12 m.	Trip to mines	Daily quiz; history of heating; warm-air heating; problems.	Daily quiz; coke and bituminous fuels; combustion problems.	Daily quiz; gas, gas boilers, etc.	Daily quiz; telephone sales campaigns.
	1 to 4:30 p. m.	At mines	Demonstration calls on warm-air installations.	Thermostatic controls	Demonstration of gas-fired equipment.	Architect contact work; new building follow-ups, etc.
Wednesday	9 a. m. to 12 m.	do	Daily quiz; hot-water, vapor, and steam systems.	Daily quiz; magazine feed boilers.	Daily quiz; vacuum cleaners and operating costs.	Daily quiz; prepared customer sales talk and personal solicitation methods.
	1 to 4:30 p. m.	do	Hot-water, vapor, and steam systems; problems.	Demonstration on magazine feed boilers.	Problems and use of cleaners by each class member.	Dealer merchandising campaigns.
Thursday	9 a. m. to 12 m.	Quiz on trip to mines; lecture on natural draft.	Daily quiz; additional problems on heat loss from buildings; pipe and boiler sizes.	Daily quiz; forced draft and forced-draft equipment.	Daily quiz; high-pressure boilers and equipment.	Do.
	1 to 4:30 p. m.	Natural draft; problems	Checking radiator and boiler sizes of an operating installation.	Demonstration on forced-draft installations.	Demonstration calls on high-pressure installations.	Do.
Friday	9 a. m. to 12 m.	Daily quiz; inspection trips covering heating equipment.	Daily quiz; demonstration and inspection calls on hot-water, vapor, and steam installations.	Daily quiz; stokers	Résumé of course to date	General review of course.
	1 to 4:30 p. m.	do	do	Stokers	Quiz on all work to date	Final written examination on sales and merchandise methods.

These 5-week classes were conducted in Philadelphia during 1930. The requests for registration were more numerous than could be handled. It is planned to extend the classes to other cities on the same basis. The retailers trained in the schools of the service during 1930 numbered 770, bringing the total number from the time the schools were started to 3,569, from 118 cities.

It is not sufficient that a retailer pass through the class, but the results of his training are ascertained. When a retailer has graduated from the class and has been back at his business for six months a comparison of the six months' sales with the same period of the previous year is obtained.

In addition to giving technical training and furnishing advice to the distributors of anthracite the service also, through its various local offices, furnishes speakers to address Rotary clubs, civic organizations, etc., with motion pictures illustrating the mining, preparation, and utilization of anthracite. A manual has also been prepared and distributed to architects throughout the country setting forth the advantages of anthracite, its adaptability for all types of buildings, and the different heating plants found most efficient for each purpose, with suggested plans for location of heating plant, storage space, etc.

Anthracite Service issues a monthly pamphlet entitled the "Anthracite Salesman." This house organ, completing its third year in 1930, is the medium for transmitting to thousands of retail distributors and others concerned all of the helpful service information and sound merchandising ideas developed by Anthracite Service. It is mailed monthly to a list of over 15,000.

Automatic heating with anthracite.—Keen observers have repeatedly predicted that "automatic heat" will have to come and that retailers will be under the necessity of extending anthracite service of this type. It is a fact that certain retailers in several cities of New England have offered to their customers such a complete service. The details of its actual operation differ, and this so-called automatic heat service is perhaps, as yet, only in the experimental stage. It is significant, however, that it is spreading.

News notes and articles in several trade journals show a definite movement toward automatic heat with hard coal. A retailer in a Massachusetts city of about 100,000 offers complete service, including the proper tonnage of the right size of anthracite, the maintenance of the stoker equipment, and the removal of ashes. A thermostatic device relieves the customer of the necessity for giving the heating plant attention. Of course, the retailer adds service charges that cover expenses and include a profit. This particular retailer reports that he is holding anthracite customers against competitive fuels by giving the same automatic service and demonstrating its satisfaction as to economy and cleanliness.

Similar service is reported to be in operation successfully in 1 city in Maine, 3 in New Hampshire, 1 in Rhode Island, 1 in Connecticut, and 2 in Massachusetts besides the one referred to.

A recently advertised service in Rochester, N. Y., is on the same basis, with the addition of an agreement to install the heating plant and maintain it during the term of the contract. Some of the other above services also include this arrangement.

This development has followed the educational program of the Anthracite Institute and has come directly as a result of the close cooperation between Anthracite Service, the anthracite laboratory, and the retailers. Although the actual tonnage of anthracite involved in automatic-heat service in 1930 was probably not large, it is significant in its indications of future development. It is also significant in that it offers a promising medium for increasing the market for the small sizes.

PRODUCTION BY WEEKS AND MONTHS

The following tables summarize the statistics of the weekly and monthly production of anthracite that are first published in the Bureau of Mines weekly coal reports. Statistics of weekly output of anthracite are estimated from the records of cars of anthracite loaded by the nine railroads that serve the region. The weekly figures, expressed in net tons to facilitate comparison, have been adjusted to the annual total ascertained by direct canvass of the operators themselves.

The working year in the anthracite region is somewhat less than the average for the bituminous-coal industry. The region is completely unionized, and the union holidays are therefore observed by practically all mines. In addition to Eight-Hour Day (April 1) and Labor Day the anthracite miners celebrate Mitchell Day (October 29) in memory of the ending of the famous strike of 1902. Other holidays not observed in the nonunion bituminous fields, such as Memorial Day, Thanksgiving, and Armistice Day, are now generally celebrated in the anthracite region. Beginning with 1927 Washington's Birthday is counted as a half holiday. (See footnote to Table 5A.) In consequence, the theoretical working year for the anthracite mines is 303.5 days, a figure that makes no allowance for church holy days, many of which are so generally observed as to decrease production seriously.

TABLE 4A.—*Estimated weekly production of anthracite in 1930*

Week ended—	Production (net tons)	Number of working days	Average production per working day (net tons)	Week ended—	Production (net tons)	Number of working days	Average production per working day (net tons)
Jan. 4	[1] 726,000	[1] 3	[2] 265,400	July 12	1,235,000	6	205,800
Jan. 11	1,568,000	6	261,300	July 19	1,299,000	6	216,500
Jan. 18	1,407,000	6	234,500	July 26	1,390,000	6	231,700
Jan. 25	1,739,000	6	289,800	Aug. 2	1,284,000	6	214,000
Feb. 1	1,850,000	6	308,300	Aug. 9	1,119,000	6	186,500
Feb. 8	1,736,000	6	289,300	Aug. 16	1,118,000	6	186,300
Feb. 15	1,728,000	6	288,000	Aug. 23	1,694,000	6	282,300
Feb. 22	1,423,000	5.5	258,700	Aug. 30	1,917,000	6	319,500
Mar. 1	1,107,000	6	184,500	Sept. 6	1,054,000	5	210,800
Mar. 8	1,170,000	6	195,000	Sept. 13	1,426,000	6	237,700
Mar. 15	927,000	6	154,500	Sept. 20	1,260,000	6	210,000
Mar. 22	951,000	6	158,500	Sept. 27	1,140,000	6	190,000
Mar. 29	1,137,000	6	189,500	Oct. 4	1,528,000	6	254,700
Apr. 5	890,000	5	178,000	Oct. 11	1,896,000	6	316,000
Apr. 12	1,054,000	6	175,700	Oct. 18	1,296,000	6	216,000
Apr. 19	828,000	6	138,000	Oct. 25	1,856,000	6	309,300
Apr. 26	1,396,000	6	232,700	Nov. 1	1,404,000	5	280,800
May 3	1,716,000	6	286,000	Nov. 8	1,602,000	6	267,000
May 10	1,397,000	6	232,800	Nov. 15	1,344,000	5	268,800
May 17	1,154,000	6	192,300	Nov. 22	1,081,000	6	180,200
May 24	1,295,000	6	215,800	Nov. 29	1,080,000	5	216,000
May 31	1,241,000	5	248,200	Dec. 6	1,685,000	6	280,800
June 7	1,192,000	6	198,700	Dec. 13	1,209,000	6	201,500
June 14	1,182,000	6	197,000	Dec. 20	1,385,000	6	230,800
June 21	1,096,000	6	182,700	Dec. 27	965,000	5	193,000
June 28	1,423,000	6	237,200	Jan. 3, 1931	[1] 806,000	[1] 3	[2] 286,000
July 5	979,000	5	195,800				
					69,385,000	303.5	228,600

[1] Figures represent the output and number of working days in that part of the week included in the calendar year 1930. Figures of total production for the week of Jan. 4, 1930, are 1,327,000 tons, and for Jan. 3, 1931, 1,097,000 tons.

[2] Average daily production for the entire week and not for the working days that fell in the calendar year 1930.

Breakdown of stabilized operation.—Before the strike of 1925–26 anthracite production proceeded from month to month with only a moderate amount of variation. In normal years, free from labor disturbances, the output fluctuated within narrow limits and was never far short of the actual physical capacity of the mines. An unusually mild winter sometimes caused a moderate decline; the variation was relatively slight, however, and for more than a decade output hovered near 85,000,000 and 90,000,000 net tons a year.

When allowance is made for months of unequal length and various holidays production in earlier years was remarkably uniform throughout the year. In 1929, on the other hand, a distinct seasonal variation is evident; production slowed abruptly at the close of the heating season, was temporarily stimulated when the reduced prices were put into effect, but declined again to new low levels in the summer months and was only revived with the coming of colder weather. In 1930 this seasonal variation was less evident, due to the combined influence of unseasonable weather and progressive slowing down of all activity as a result of world-wide depression.

TABLE 5A.—*Estimated monthly production of anthracite and average production per working day,*[1] *1925–1930, in thousands of net tons*

Month	1925		1926		1927		1928		1929		1930	
	Total	Daily average	Total	Daily average	Total	Daily average	Total	Daily average	Total	Daily average	Total	Daily average
January	7,234	278	172	7	6,516	261	5,587	223	7,068	272	6,996	269
February	7,003	292	2,069	86	5,812	247	5,481	224	6,425	273	6,120	260
March	6,886	265	8,732	323	6,056	224	5,398	200	4,859	187	4,524	174
April	7,292	292	8,163	327	7,078	283	6,784	283	6,205	248	4,887	196
May	7,938	318	8,001	320	7,947	318	7,977	307	6,077	234	5,911	227
June	7,616	293	8,878	341	7,207	277	5,205	200	4,883	195	5,152	206
July	8,334	321	8,371	322	4,993	200	4,394	176	4,810	185	5,624	216
August	9,014	347	8,171	314	7,694	285	6,759	250	5,735	212	6,153	237
September	52	2	8,388	336	6,596	264	5,927	247	6,543	273	5,261	210
October	69	3	8,617	345	7,353	294	8,400	323	8,026	309	7,531	290
November	153	7	7,397	308	6,854	286	7,322	305	5,820	243	5,176	225
December	226	9	7,478	288	5,990	230	6,114	245	7,377	295	6,050	233
	61,817	203	84,437	278	80,096	264	75,348	248	73,828	243	69,385	229

[1] Production is estimated from weekly car loadings as reported by the American Railway Association, and includes mine fuel, coal sold locally, dredge coal, and the output of the Bernice Basin in Sullivan County. In computing the average rates per working day, New Year's, Eight-Hour Day (Apr. 1), Memorial Day, Independence Day, Labor Day, Mitchell Day (Oct. 29), Thanksgiving Day, Christmas and, since the war, Armistice Day have been counted as holidays. Beginning with 1927, Washington's Birthday is counted as a half holiday. No allowance, however, has been made for church holy days, which are observed by many of the miners. Monthly statistics from 1905 to 1922 will be found in Coal in 1925, pp. 427–428.

PRODUCTION IN THE LEHIGH, SCHUYLKILL, AND WYOMING REGIONS

The total production of Pennsylvania anthracite in 1930, including colliery fuel, local sales, and dredge and washery coal, was 61,950,747 gross tons, and the total value at the mines was $354,574,191. In comparison with 1929 this is a decrease of 6 per cent in tonnage and 8 per cent in value.

This decrease was chiefly accounted for by the Wyoming region, where production fell from 37,470,574 tons in 1929 to 34,069,789 tons in 1930, a decrease of 3,400,785 tons or 9 per cent. Production also was lower in the Bernice Basin in Sullivan County and in the Lehigh region, and these losses were only partly offset by a gain in the Schuylkill region, where production advanced from 19,223,195 tons in 1929 to 19,386,018 tons in 1930. The output of the Lehigh region decreased from 9,114,152 to 8,437,733 tons. An analysis of production by regions is given in Table 6A.

Of the total production 54,644,694 tons or 88.2 per cent consisted of shipments and 2,807,530 tons of local sales made within the anthracite region or in the vicinity of the river dredges and the mines of Sullivan County. The sum of these two items—57,452,224 gross tons—constituted the "commercial production," and in 1930 it was valued at $347,046,932, or $6.04 per ton, as compared with $6.17 per ton in 1929. In addition to shipments and local sales, 4,498,523 tons were used as colliery fuel in 1930. Its value for cost-keeping purposes is placed at $7,527,259.

The figures giving value for the period 1926 to 1929 are strictly comparable with each other but not with those for earlier years. In 1926 a change was made in estimating the value of the production of one large company in the Wyoming region, which has reported its tonnage but not its value. The new method, fully explained in Coal in 1926 (pp. 555, 576–580), yields more accurate results than that formerly employed. The change, although slight, should be kept in mind when tables relating to values are considered. The 1930 figures have been computed to show values on a basis comparable to 1929 and exactly as reported to the Bureau of Mines; this was made necessary through a merger of two large producers at the beginning of the year, one of which had previously sold its output through its own sales office and had reported full value realized but which after the merger reported the realization on mine basis.

TABLE 6A.—*Anthracite produced, by regions, 1929 and 1930*

Region	Shipments		Local sales		Used for power		Total	
	Gross tons	Value[1]	Gross tons	Value	Gross tons	Value	Gross tons	Value[1]
1929								
Lehigh:								
Breaker product	8,119,806	$48,874,675	305,888	$1,632,082	610,564	$1,454,142	9,036,258	$51,960,899
Dredge product	77,894	91,136	----	----	----	----	77,894	91,136
	8,197,700	48,965,811	305,888	1,632,082	610,564	1,454,142	9,114,152	52,052,035
Schuylkill:								
Breaker product	15,902,804	93,051,030	639,840	3,484,624	1,764,284	3,092,616	18,306,928	99,628,270
Washery product	322,392	732,231	2,675	8,016	28,965	49,889	354,032	790,136
Dredge product	211,740	146,991	349,460	387,196	1,035	864	562,235	535,051
	16,436,936	93,930,252	991,975	3,879,836	1,794,284	3,143,369	19,223,195	100,953,457
Wyoming:								
Breaker product	33,221,724	218,680,716	1,580,296	8,438,332	2,300,339	3,404,222	37,102,359	230,523,270
Washery product	361,794	1,523,518	1,062	4,529	5,359	8,326	368,215	1,536,373
	33,583,518	220,204,234	1,581,358	8,442,861	2,305,698	3,412,548	37,470,574	232,059,643
Sullivan County: Breaker product	80,577	483,055	7,407	54,761	22,126	39,800	110,110	577,616
Total breaker product	57,324,911	361,089,476	2,533,431	13,609,799	4,697,313	7,990,780	[2]64,555,655	382,690,055
Total washery product	684,186	2,255,749	3,737	12,545	34,324	58,215	722,247	2,326,509
Total dredge product	289,634	238,127	349,460	387,196	1,035	864	640,129	626,187
Grand total	58,298,731	363,583,352	2,886,628	14,009,540	4,732,672	8,049,859	65,918,031	385,642,751
1930								
Lehigh:								
Breaker product	[3]7,541,452	[3]44,697,019	264,534	1,500,232	577,980	1,127,129	[3]8,383,966	[3]47,324,380
Washery product	(3)	(3)	----	----	----	----	(3)	(3)
Dredge product	53,767	60,434	----	----	----	----	53,767	60,434
	7,595,219	44,757,453	264,534	1,500,232	577,980	1,127,129	8,437,733	47,384,814

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[1] Value given is value at which coal left possession of producing company f. o. b. mines and does not include margins of separately incorporated sales companies. In 1930 a producer in the Lehigh and Wyoming regions, which formerly sold its output direct, was merged with a larger producer selling through a separately incorporated sales company, and in consequence the value figures for 1930 are not exactly comparable with those for earlier years.

[2] Includes about 381,000 tons of culm-bank coal put through the breakers.

[3] A small amount of washery product is included with breaker product to avoid disclosing operators' figures.

TABLE 6A.—*Anthracite produced, by regions, 1929 and 1930*—Continued

Region	Shipments		Local sales		Used for power		Total	
	Gross tons	Value	Gross tons	Value	Gross tons	Value	Gross tons	Value
1930								
Schuylkill:								
Breaker product	16, 154, 392	$91, 852, 454	703, 332	$3, 737, 680	1, 452, 825	$2, 528, 010	18, 310, 549	$98, 118, 144
Washery product	543, 842	1, 025, 764	6, 319	7, 754	4, 708	8, 200	554, 869	1, 041, 718
Dredge product	274, 822	208, 006	245, 158	269, 208	620	620	520, 600	477, 834
	16, 973, 056	93, 086, 224	954, 809	4, 014, 642	1, 458, 153	2, 536, 830	19, 386, 018	99, 637, 696
Wyoming:								
Breaker product	29, 693, 773	193, 745, 002	1, 569, 323	7, 997, 669	2, 390, 469	3, 751, 619	33, 653, 565	205, 494, 290
Washery product	343, 836	1, 558, 383	11, 767	62, 470	60, 621	94, 681	416, 224	1, 715, 534
	30, 037, 609	195, 303, 385	1, 581, 090	8, 060, 139	2, 451, 090	3, 846, 300	34, 069, 789	207, 209, 824
Sullivan County: Breaker product	38, 810	274, 736	7, 097	50, 121	11, 300	17, 000	57, 207	341, 857
Total breaker product	53, 428, 427	330, 569, 211	2, 544, 286	13, 285, 702	4, 432, 574	7, 423, 758	[4] 60, 405, 287	351, 278, 671
Total washery product	887, 678	2, 584, 147	18, 086	70, 224	65, 329	102, 881	971, 093	2, 757, 252
Total dredge product	328, 589	268, 440	245, 158	269, 208	620	620	574, 367	538, 268
Grand total	54, 644, 694	333, 421, 798	2, 807, 530	13, 625, 134	4, 498, 523	7, 527, 259	61, 950, 747	354, 574, 191

[4] Includes about 171,000 tons of culm-bank coal put through the breakers.

The relative importance of the three principal producing regions (excluding Sullivan County) over a period extending back to the early days of the industry is indicated by comparative figures on shipments shown in Table 7A. Mining began in the Wyoming and then in the Lehigh region, but for the 30 years after 1830 the Schuylkill region was the largest producer. (Coal in 1923, p. 705, fig. 53.) After the Civil War the Wyoming region gained rapidly and since 1885 has supplied 50 per cent or more of the shipments. During the last 20 years only slight temporary changes have occurred in the relative proportions shipped by the different regions. In 1930 the Wyoming region contributed 55 per cent of the shipments, the Schuylkill region 31.1 per cent, and the Lehigh region 13.9 per cent.

TABLE 7A.—*Anthracite shipped from the Lehigh, Schuylkill, and Wyoming regions, 1807–1930*

[Detailed figures for each year of the period 1820 to 1922 will be found in Coal in 1924, pp. 570–571. Beginning with 1914 the figures in this series include dredge shipments. Note, however, that Sullivan County is not included, because no record of it is available prior to 1890]

Year	Lehigh region		Schuylkill region		Wyoming region		Total (gross tons)
	Gross tons	Percentage	Gross tons	Percentage	Gross tons	Percentage	
1807	----------	----------	----------	----------	55	----------	55
1820	365	----------	----------	----------	----------	----------	365
1830	41,750	23.9	89,984	51.5	43,000	24.6	174,734
1840	225,313	26.1	490,596	56.7	148,470	17.2	864,379
1850	690,456	20.6	1,840,620	54.8	827,823	24.6	3,358,899
1860	1,821,674	21.4	3,749,632	44.0	2,941,817	34.6	8,513,123
1870	3,239,374	20.0	4,968,157	30.7	7,974,660	49.3	16,182,191
1880	4,463,221	19.0	7,554,742	32.3	11,419,279	48.7	23,437,242
1890	6,329,658	17.3	10,867,822	29.7	19,417,979	53.0	36,615,459
1900	6,918,627	15.3	13,502,732	30.0	24,686,125	54.7	45,107,484
1910	8,627,539	13.3	17,845,020	27.5	38,433,227	59.2	64,905,786
1920	9,939,241	14.6	20,733,428	30.4	37,517,036	55.0	68,189,705
1923	10,154,616	13.9	22,214,576	30.4	40,777,698	55.7	73,146,890
1924	9,288,543	13.5	19,607,200	28.5	39,917,803	58.0	68,813,546
1925	6,719,060	14.0	13,954,495	29.1	27,229,261	56.9	47,902,816
1926	9,398,932	14.0	18,934,971	28.3	38,709,086	57.7	67,042,989
1927	8,778,802	14.0	18,866,778	30.0	35,178,302	56.0	62,823,882
1928	7,945,048	13.4	18,085,378	30.5	33,226,319	56.1	59,256,745
1929	8,197,700	14.1	16,436,936	28.2	33,583,518	57.7	58,218,154
1930	7,595,219	13.9	16,973,056	31.1	30,037,609	55.0	54,605,884

PRODUCTION BY FIELDS AND COUNTIES

The classification by trade regions—Lehigh, Schuylkill, and Wyoming—is the one most commonly used by the trade. It is paralleled by the organization of the United Mine Workers, in which district 1 corresponds to the Wyoming trade region, district 7 to the Lehigh region, and district 9 to the Schuylkill region. In studies of costs of production and reserves, however, a classification adopted by geologists is more useful because it corresponds more closely to the natural conditions that largely govern mining costs. The geologic classification recognizes four fields—the Northern, Eastern Middle, Western Middle, and Southern. The Northern field is identical with the Wyoming region. That part of the Southern field lying east of Tamaqua, known as the Panther Creek Valley, and the Eastern Middle field make up the Lehigh region. That part of the Southern field west of Tamaqua and the Western Middle field compose the Schuylkill region. The Bernice Basin in Sullivan County is sometimes grouped with the Northern field.

The geological conditions in these four producing fields vary considerably. Mining conditions are most favorable in the Northern and Eastern Middle fields, where the beds are generally thicker and less faulted and folded than in the Western Middle and Southern fields. These differences affect the cost of mining. In the Northern and Eastern Middle fields the output per man has been relatively high and the cost of production correspondingly low. These advantages, however, have so stimulated production that most of the easily accessible coal has been extracted in many of the collieries in these areas. Exhaustion of the virgin coal and the necessity of resorting to second or even third mining has offset the natural advantages, and to-day the average output per man differs little from that in the Western Middle and Southern fields, where the natural handicaps were originally more severe. In 1930, the Southern field had the highest output per man underground per day—2.76 gross tons—while the Northern field made the poorest showing, with an average of 2.20 tons per man underground per day. The average for all fields in 1930 was 2.35 tons. (See Table 8A.)

Natural conditions also have an important bearing on the value of the product. In the Northern and Eastern Middle fields the yield of the profitable domestic sizes is high. In the Western Middle and particularly in the Southern field it is low due to crushing of the coal by the faulting and folding of the beds. With respect to the percentage of domestic sizes shipped, the Northern and Eastern Middle fields still hold a decided advantage over the Western Middle and Southern fields. In 1930 the proportion of domestic sizes in breaker shipments in the Northern field was 74.8 per cent and in the Eastern Middle 70.8 per cent, as compared with 66.8 per cent for the Western Middle and 59.3 per cent for the Southern field. The average for all fields in 1930 was 70.6 per cent.

TABLE 8A.—*Daily output of deep-mined anthracite per man underground and per cent of domestic sizes in breaker shipments, by fields, 1928–1930*

Field	1928		1929		1930	
	Gross tons of deep-mined coal produced per man underground per day [1]	Per cent of domestic sizes in breaker shipments	Gross tons of deep-mined coal produced per man underground per day [1]	Per cent of domestic sizes in breaker shipments	Gross tons of deep-mined coal produced per man underground per day [1]	Per cent of domestic sizes in breaker shipments
Northern	2. 18	75. 4	2. 21	75. 2	2. 20	74. 8
Eastern Middle	2. 54	73. 3	2. 63	72. 2	2. 61	70. 8
Western Middle	2. 50	67. 7	2. 53	68. 1	2. 48	66. 8
Southern	2. 56	58. 4	2. 65	59. 9	2. 76	59. 3
Average	2. 32	71. 2	2. 36	71. 5	2. 35	70. 6

[1] Excluding culm-bank and strip-pit coal.

Table 9A.—*Anthracite produced, by fields, 1919–1930, in gross tons*

[The figures of breaker product include a certain quantity of culm-bank coal, which in 1930 amounted to about 171,000 tons. Data for 1913–1918 will be found in Coal in 1925, p. 517]

Year	Northern field[1]				Eastern Middle field			Western Middle field			
	Breakers	Washeries	Dredges	Total	Breakers	Washeries	Total	Breakers	Washeries	Dredges	Total
1919	41,650,000	1,801,000	18,000	43,469,000	7,284,000	288,000	7,572,000	14,983,000	871,000	247,000	16,101,000
1920	40,398,000	2,939,000	29,000	43,366,000	7,010,000	115,000	7,125,000	16,123,000	942,000	240,000	17,305,000
1921	44,629,000	920,000	35,000	45,584,000	6,862,000	78,000	6,940,000	16,674,000	319,000	199,000	17,192,000
1922	24,971,000	1,032,000	48,000	26,051,000	4,121,000	36,000	4,157,000	9,651,000	995,000	194,000	10,840,000
1923	43,804,000	1,859,000	28,000	45,691,000	7,039,000	122,000	7,161,000	16,548,000	1,019,000	194,000	17,761,000
1924	44,071,000	552,000	14,000	44,637,000	6,808,000	6,000	6,814,000	15,136,000	423,000	204,000	15,763,000
1925	30,184,000	359,000	78,000	30,621,000	4,909,000	----------	4,909,000	10,633,000	334,000	248,000	11,215,000
1926	42,290,000	701,000	16,000	43,007,000	6,446,000	18,000	6,464,000	14,483,000	441,000	255,000	15,179,000
1927	38,874,000	557,000	----------	39,431,000	6,178,000	----------	6,178,000	13,673,000	832,000	351,000	14,856,000
1928	36,772,000	465,000	----------	37,237,000	5,827,000	----------	5,827,000	12,908,000	651,000	361,000	13,920,000
1929	37,213,000	368,000	----------	37,581,000	6,054,000	----------	6,054,000	12,121,000	241,000	200,000	12,562,000
1930	33,711,000	416,000	----------	34,127,000	[2] 5,811,000	(2)	5,811,000	12,427,000	466,000	236,000	13,129,000

Year	Southern field				Total			
	Breakers	Washeries	Dredges	Total	Breakers	Washeries	Dredges	Total
1919	10,245,000	913,000	354,000	11,512,000	74,162,000	3,873,000	619,000	78,654,000
1920	10,137,000	1,673,000	392,000	12,202,000	73,668,000	5,669,000	661,000	79,998,000
1921	10,341,000	400,000	323,000	11,064,000	78,506,000	1,717,000	557,000	80,780,000
1922	6,331,000	880,000	565,000	7,776,000	45,074,000	2,943,000	807,000	48,824,000
1923	11,077,000	1,016,000	632,000	12,725,000	78,468,000	4,016,000	854,000	83,338,000
1924	10,654,000	119,000	519,000	11,292,000	76,669,000	1,100,000	737,000	78,506,000
1925	7,639,000	229,000	581,000	8,449,000	53,365,000	922,000	907,000	55,194,000
1926	10,157,000	38,000	546,000	10,741,000	73,376,000	1,198,000	817,000	75,391,000
1927	10,415,000	117,000	517,000	11,049,000	69,140,000	1,506,000	868,000	71,514,000
1928	9,595,000	215,000	481,000	10,291,000	65,102,000	1,331,000	842,000	67,275,000
1929	9,168,000	113,000	440,000	9,721,000	64,556,000	722,000	640,000	65,918,000
1930	8,456,000	89,000	339,000	8,884,000	60,405,000	971,000	575,000	61,951,000

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[1] Includes Sullivan County, which in 1930 contributed 57,000 tons of breaker product.

[2] A small amount of washery product is included with the breaker product.

For those who may be interested in a segregation by political units, Table 10A gives the breakdown of production by counties for 1929 and 1930. From this table it will be seen that while anthracite was produced in 18 counties in 1929 and 16 in 1930, production was concentrated chiefly in Luzerne, Lackawanna, Schuylkill, Northumberland, Carbon, and Dauphin Counties. These six counties normally account for over 98 per cent of the total output. Luzerne County is by far the most important producer, with Schuylkill and Lackawanna Counties competing for second place and Northumberland, Carbon, and Dauphin ranking next in the order named.

In 1930, 24,830,000 tons, or slightly more than 40 per cent of the total production, came from Luzerne County; 14,240,000 tons, or 23 per cent, from Schuylkill County; 13,519,000 tons, or 21.8 per cent, from Lackawanna County; 6,239,000 tons, or 10.1 per cent, from Northumberland County; 1,484,000 tons, or 2.4 per cent, from Carbon County; and 900,000 tons, or 1.5 per cent, from Dauphin County. The remaining 739,000 tons, or 1.2 per cent, were divided among the 10 small producing counties.

TABLE 10A.—*Anthracite produced, by counties, 1929 and 1930*

County	Shipments		Local sales		Used for power		Total	
	Gross tons	Value[1]	Gross tons	Value	Gross tons	Value	Gross tons	Value[1]
1929								
Carbon	1,658,000	$9,292,000	40,000	$260,000	87,000	$274,000	1,785,000	$9,826,000
Columbia	247,000	1,530,000	29,000	75,000	52,000	93,000	328,000	1,698,000
Dauphin	687,000	4,122,000	221,000	372,000	104,000	181,000	1,012,000	4,675,000
Lackawanna	13,947,000	90,328,000	622,000	3,525,000	804,000	1,200,000	15,373,000	95,053,000
Luzerne	23,148,000	152,573,000	1,170,000	5,968,000	1,833,000	2,955,000	26,151,000	161,496,000
Northumberland	4,747,000	26,082,000	222,000	955,000	446,000	773,000	5,415,000	27,810,000
Schuylkill	13,307,000	76,774,000	472,000	2,601,000	1,345,000	2,475,000	15,124,000	81,850,000
Sullivan	81,000	483,000	7,000	55,000	22,000	40,000	110,000	578,000
Susquehanna and Wayne	375,000	2,293,000	15,000	84,000	40,000	59,000	430,000	2,436,000
Berks, Cumberland, Lebanon, Montour, Northampton, and York[2]	102,000	106,000	88,000	115,000			190,000	221,000
	58,299,000	363,583,000	2,886,000	14,010,000	4,733,000	8,050,000	65,918,000	385,643,000
1930								
Carbon	1,378,000	7,496,000	42,000	265,000	64,000	169,000	1,484,000	7,930,000
Columbia	202,000	1,255,000	26,000	51,000	21,000	37,000	249,000	1,343,000
Dauphin	661,000	3,738,000	150,000	301,000	89,000	155,000	900,000	4,194,000
Lackawanna	12,098,000	78,360,000	612,000	3,275,000	809,000	1,295,000	13,519,000	82,930,000
Luzerne	21,694,000	140,527,000	1,134,000	5,678,000	2,002,000	3,202,000	24,830,000	149,407,000
Northumberland	5,652,000	29,885,000	244,000	986,000	343,000	578,000	6,239,000	31,449,000
Schuylkill	12,582,000	70,239,000	528,000	2,885,000	1,130,000	2,027,000	14,240,000	75,151,000
Sullivan	39,000	275,000	7,000	50,000	11,000	17,000	57,000	342,000
Susquehanna and Wayne	261,000	1,565,000	11,000	66,000	30,000	47,000	302,000	1,678,000
Berks, Cumberland, Lebanon, Montour, Northhampton, and York[2]	78,000	82,000	53,000	68,000			131,000	150,000
	54,645,000	333,422,000	2,807,000	13,625,000	4,499,000	7,527,000	61,951,000	354,574,000

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[1] Value given for shipments is value at which coal left possession of producing company f. o. b. mines and does not include margins of separately incorporated selling companies.

[2] Counties producing dredge coal only.

FRESH-MINED AND CULM-BANK COAL, BREAKER AND WASHERY PRODUCT

Reconciliation of fresh-mined, culm-bank, and breaker product.—Anthracite is now produced from three sources—from mines, from old culm banks, and from the rivers that drain the anthracite region. As all three sources contribute to the country's supply, it is important to consider them all to ascertain the total production. A full explanation of the method used in reconciling figures on production from the three sources is given in Coal in 1926, pages 562 and 563. No difficulty is experienced in separating the figures of production by dredges. It is difficult to draw a sharp line that can be maintained throughout the statistics of the industry, however, between the fresh-mined and the culm-bank coal.

As the best solution of this problem the individual breaker, washery, or dredge is taken as the unit in compiling the statistics. The producing companies are asked to supply separate statements for each breaker, washery, or dredge. These are totaled to form the primary tables of this report to show the total quantity of breaker product, washery product, and dredge product, with related figures of value, number of employees, and time worked.

The figures of breaker and washery product, however, are not exactly equivalent to the fresh-mined and culm-bank coal because of the practice sometimes adopted of putting culm-bank coal through a breaker, either directly from the bank or after preliminary treatment in a washery. To obtain accurate statistics of the culm-bank coal each company is now asked to recapitulate its total production of fresh-mined and culm-bank coal. The results are shown in Table 11A.

Of the 60,405,287 tons handled by breakers in 1930, only 171,017 tons were culm-bank coal. The fresh-mined coal amounted to 60,234,270 tons. The washeries handled 971,093 tons, but including the 171,017 tons of bank coal run through the breakers the total produced from culm banks was 1,142,110 tons.

Culm-bank coal.—Owing to the gradual cleaning up of the old culm banks and to adverse market conditions, the quantity of culm-bank coal recovered has declined sharply in recent years. Although in 1930 the tonnage produced from the culm banks was slightly more than in the preceding year, in comparison with the 6,348,963 tons recovered from the banks in 1923 the total for 1930 shows a decrease of nearly 82 per cent.

The practice of treating culm-bank coal in breakers in 1930 was most common in the Northern, Western Middle, and Southern fields. Table 12A shows that of the 171,000 tons of culm-bank coal put through the breakers in 1930 the Northern field accounted for 67,000 tons, the Western Middle for 52,000 tons, the Southern for 46,000 tons, and the Eastern Middle for 6,000 tons. The Southern field showed a decrease of 153,000 tons from 1929, the Western Middle field 52,000 tons, and the Eastern Middle 7,000 tons, while the Northern field showed an increase of 2,000 tons.

TABLE 11A.—*Comparison of anthracite production, 1923–1930, classified as fresh-mined, culm-bank, and river coal and as breaker, washery, and dredge product, in gross tons*

[Data in this form were not collected prior to 1923. See Coal in 1923, pp. 697–700, for interpretation of the records of fresh-mined and washery coal before that year]

	Classified by source of coal	Classified by type of preparation plant	Difference
1923			
Fresh-mined coal	76,135,538		+2,332,837
Breaker product		78,468,375	
Culm-bank coal	[1] 6,348,963		−2,332,837
Washery product		4,016,126	
River coal	853,900		
Dredge product		853,900	
	83,338,401	83,338,401	
1924			
Fresh-mined coal	75,656,355		+1,013,000
Breaker product		76,669,355	
Culm-bank coal	[1] 2,112,813		−1,013,000
Washery product		1,099,813	
River coal	736,959		
Dredge product		736,959	
	78,506,127	78,506,127	
1925			
Fresh-mined coal	52,437,725		+927,000
Breaker product		53,364,725	
Culm-bank coal	[1] 1,849,276		−927,000
Washery product		922,276	
River coal	906,882		
Dredge product		906,882	
	55,193,883	55,193,883	
1926			
Fresh-mined coal	71,839,920		+1,536,000
Breaker product		73,375,920	
Culm-bank coal	[1] 2,733,908		−1,536,000
Washery product		1,197,908	
River coal	816,754		
Dredge product		816,754	
	75,390,582	75,390,582	
1927			
Fresh-mined coal	67,688,369		+1,452,000
Breaker product		69,140,369	
Culm-bank coal	[1] 2,957,833		−1,452,000
Washery product		1,505,833	
River coal	867,694		
Dredge product		867,694	
	71,513,896	71,513,896	
1928			
Fresh-mined coal	64,417,666		+684,000
Breaker product		65,101,666	
Culm-bank coal	[1] 2,015,074		−684,000
Washery product		1,331,074	
River coal	842,322		
Dredge product		842,322	
	67,275,062	67,275,062	
1929			
Fresh-mined coal	64,174,655		+381,000
Breaker product		64,555,655	
Culm-bank coal	[1] 1,103,247		−381,000
Washery product		722,247	
River coal	640,129		
Dredge product		640,129	
	65,918,031	65,918,031	
1930			
Fresh-mined coal	60,234,270		+171,017
Breaker product		60,405,287	
Culm-bank coal	[1] 1,142,110		−171,017
Washery product		971,093	
River coal	574,367		
Dredge product		574,367	
	61,950,747	61,950,747	

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[1] Includes about 2,300,000 tons of coal put through the breakers in 1923, 1,013,000 tons in 1924, 927,000 tons in 1925, 1,536,000 tons in 1926, 1,452,000 tons in 1927, 684,000 tons in 1928, 381,000 tons in 1929, and 171,017 tons in 1930.

TABLE 12A.—*Culm-bank coal put through breakers, by fields, 1924–1930, in gross tons*

Year	Northern	Eastern Middle	Western Middle	Southern	Total
1924	170,000	220,000	386,000	237,000	1,013,000
1925	173,000	181,000	396,000	177,000	927,000
1926	271,000	230,000	542,000	493,000	1,536,000
1927	313,000	273,000	333,000	533,000	1,452,000
1928	77,000	87,000	279,000	241,000	684,000
1929	65,000	13,000	104,000	199,000	381,000
1930	67,000	6,000	52,000	46,000	171,000

Anthracite shipped from breakers, washeries, and dredges since 1890.—By limiting the comparison to shipments the relative growth of breaker, washery, and dredge operations since 1890 can be shown. (Table 13A.) Washery shipments began to assume importance in the late nineties and reached their maximum in 1918 with 6,506,000 tons. Since the war the tendency has been downward. In 1929 the washery shipments were smaller than at any time since 1897, but in 1930 they recovered to about the 1925 total. The first statistical record of shipments by dredges was in 1909, when 9,000 tons were sold. The maximum tonnage of river coal was shipped in 1922.

TABLE 13A.—*Anthracite shipped from breakers, washeries, and dredges, 1890–1930, in gross tons*

[Includes shipments for Sullivan County, except for 1895, for which no data are available. Detailed figures for each year of the period up to 1924 will be found in Coal in 1924, p. 574]

Year	Breakers[1]	Washeries[1]	Dredges	Total
1890	36,573,000	42,000	----------	36,615,000
1895	45,430,000	1,081,000	----------	46,511,000
1900	43,218,000	2,059,000	----------	45,277,000
1905	59,010,000	2,644,000	----------	61,654,000
1910	62,417,000	3,296,000	22,000	65,735,000
1915	66,174,000	2,475,000	17,000	68,666,000
1917	72,077,000	5,366,000	47,000	77,490,000
1918	70,090,000	6,506,000	125,000	76,721,000
1919	64,632,000	3,017,000	323,000	67,972,000
1920	63,599,000	4,616,000	396,000	68,611,000
1921	67,981,000	1,308,000	265,000	69,554,000
1922	37,907,000	2,600,000	567,000	41,074,000
1923	69,289,000	3,754,000	385,000	73,428,000
1924	67,592,000	1,060,000	319,000	68,971,000
1925	46,615,000	872,000	520,000	48,007,000
1926	65,826,000	1,068,000	355,000	67,249,000
1927	61,130,000	1,317,000	495,000	62,942,000
1928	57,636,000	1,245,000	483,000	59,364,000
1929	57,325,000	684,000	290,000	58,299,000
1930	[2]53,428,000	[2]888,000	329,000	54,645,000

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[1] Includes about 2,300,000 tons of coal put through the breakers in 1923, 1,013,000 tons in 1924, 927,000 tons in 1925, 1,536,000 tons in 1926, 1,452,000 tons in 1927, 684,000 tons in 1928, 381,000 tons in 1929, and 171,000 tons in 1930.

[2] A small amount of washery product is included with the breaker product.

DETAILS OF SHIPMENTS, BY REGIONS AND SIZES

As previously pointed out the yield of the profitable domestic sizes varies considerably in the different regions, owing to the geological conditions encountered in mining. Table 14A gives the details of shipments by sizes and regions for the last two years. It will be noted from this table that of the breaker product the proportion of domestic sizes in 1930 was highest in the Wyoming region, where the domestic sizes comprised 74.8 per cent of the shipments, and was lowest in the Schuylkill region, where only 64.5 per cent of the breaker shipments was domestic coal. The average for all regions, including Sullivan County, was 70.6 per cent in 1930, as against 71.5 per cent in 1929.

TABLE 14A.—*Anthracite shipped, by regions and sizes, 1929 and 1930, in gross ton*

[The figures of shipments from breakers include a considerable tonnage of culm-bank coal handled in the breakers]

Size	Breaker shipments				Washery shipments	Dredge shipments	Grand total
	Lehigh region	Schuylkill region	Wyoming region	Total (including Sullivan County)			
1929							
Lump[1] and broken	14,589	127,073	193,625	335,412	1,216	---------	336,628
Egg	609,483	1,420,715	4,506,713	6,542,775	23,817	---------	6,566,592
Stove	2,008,164	3,602,727	9,130,835	14,762,875	59,583	---------	14,822,458
Chestnut	2,145,166	3,900,015	8,618,261	14,684,380	100,920	---------	14,785,300
Pea	749,551	1,326,014	2,554,345	4,636,115	50,742	---------	4,686,857
Total domestic	5,526,953	10,376,544	25,003,779	40,961,557	236,278	---------	41,197,835
Buckwheat No. 1	1,108,924	2,483,540	3,975,122	7,569,713	106,227	(2)	7,675,940
Buckwheat No. 2 (rice)	625,986	1,129,686	2,435,399	4,192,465	119,877	[2] 3,219	4,315,561
Buckwheat No. 3 (barley)	805,933	1,652,660	1,535,408	3,994,770	175.404	183,907	4,354,081
Boiler	---------	30,490	25,990	56,498	9,587	(3)	66,085
Other[4]	52,010	229,884	246,026	549,908	36,813	[3] 102,508	689,229
Total steam	2,592,853	5,526,260	8,217,945	16,363,354	447,908	289,634	17,100,896
Grand total	8,119,806	15,902,804	33,221,724	57,324,911	684,186	289,634	58,298,731
1930							
Lump[1] and broken	16,425	103,630	138,658	258,763	968	---------	259,731
Egg	535,980	1,387,339	3,684,905	5,611,482	21,528	---------	5,633,010
Stove	1,852,306	3,578,580	8,279,431	13,722,797	56,427	---------	13,779,224
Chestnut	[5] 1,985,746	3,946,772	7,775,676	[5] 13,720,759	[5] 98,908	[6] 149	13,819,816
Pea	[5] 667,973	1,396,485	2,322,302	[5] 4,391,195	[5] 70,674	---------	4,461,869
Total domestic	[5] 5,058,430	10,412,806	22,200,972	[5] 37,704,996	[5] 248,505	[6] 149	37,953,650
Buckwheat No. 1	[5] 1,153,918	2,491,120	3,850,652	[5] 7,496,695	[5] 153,172	1,947	7,651,814
Buckwheat No. 2 (rice)	[5] 587,265	1,297,806	2,150,340	[5] 4,036,023	[5] 161,653	---------	4,197,676
Buckwheat No. 3 (barley)	[5] 687,510	1,739,579	1,236,126	[5] 3,663,600	[5] 241,487	280,462	4,185,549
Boiler	---------	51,544	10,372	65,877	152	13,001	79,030
Other[4]	54,329	161,537	245,311	461,236	82,709	33,030	576,975
Total steam	[5] 2,483,022	5,741,586	7,492,801	[5] 15,723,431	[5] 639,173	328,440	16,691,044
Grand total	[5] 7,541,452	16,154,392	29,693,773	[5] 53,428,427	[5] 887,678	328,589	54,644,694

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[1] The quantity of lump included is insignificant.

[2] A small amount of buckwheat No. 1 is included with buckwheat No. 2.

[3] A small amount of boiler coal is included with "Other" sizes.

[4] Includes buckwheat No. 4, silt, culm, screenings, mine-run coal, slush, and unsized coal smaller than pea.

[5] A small amount of washery product is included with breaker product to avoid disclosing operators' figures.

[6] Includes some pea coal.

TABLE 15A.—*Value of anthracite shipped, by regions and sizes, 1929 and 1930*[1]

Size	Breaker shipments								Washery shipments		Dredge shipments		Grand total	
	Lehigh region		Schuylkill region		Wyoming region		Total							
	Total	Average per ton	Total	Average per ton	Total	Average per ton	Total (including Sullivan County)	Average per ton	Total	Average per ton	Total	Average per ton	Total	Average per ton
1929														
Lump[2] and broken	$116,138	$7.96	$1,038,373	$8.17	$1,505,920	$7.78	$2,661,431	$7.93	$9,500	$7.81	----------	----------	$2,670,931	$7.93
Egg	5,001,982	8.21	11,745,175	8.27	36,746,797	8.15	53,543,715	8.18	194,467	8.17	----------	----------	53,738,182	8.18
Stove	17,364,936	8.65	31,681,134	8.79	79,515,331	8.71	128,740,268	8.72	439,404	7.37	----------	----------	129,179,672	8.72
Chestnut	17,819,883	8.31	32,153,302	8.24	70,991,244	8.24	121,136,976	8.25	677,941	6.72	----------	----------	121,814,917	8.24
Pea	3,450,489	4.60	6,027,556	4.55	12,097,421	4.74	21,607,561	4.66	206,018	4.06	----------	----------	21,813,579	4.65
Total domestic	43,753,428	7.92	82,645,540	7.96	200,856,713	8.03	327,689,951	8.00	1,527,330	6.46	----------	----------	329,217,281	7.99
Buckwheat No. 1	2,894,573	2.61	6,204,721	2.50	10,801,026	2.72	19,906,120	2.63	272,797	2.57	(3)	(3)	20,178,917	2.63
Buckwheat No. 2 (rice)	1,139,222	1.82	1,917,554	1.70	4,380,111	1.80	7,439,387	1.77	197,802	1.65	[3]$3,945	[3]$1.23	7,641,134	1.77
Buckwheat No. 3 (barley)	1,068,930	1.33	2,138,560	1.29	2,113,772	1.38	5,322,362	1.33	224,480	1.28	168,277	.92	5,715,119	1.31
Boiler	----------	----------	10,682	.35	17,504	.67	28,198	.50	7,436	.78	(4)	(4)	35,634	.54
Other	18,522	.36	133,973	.58	511,590	2.08	703,458	1.28	25,904	.70	[4]65,905	[4].64	795,267	1.15
Total steam	5,121,247	1.98	10,405,490	1.88	17,824,003	2.17	33,399,525	2.04	728,419	1.63	238,127	0.82	34,366,071	2.01
Grand total	48,874,675	6.02	93,051,030	5.85	218,680,716	6.58	361,089,476	6.30	2,255,749	3.30	238,127	0.82	363,583,352	6.24
1930														
Lump[2] and broken	126,178	7.68	826,260	7.97	1,081,175	7.80	2,034,013	7.86	7,600	7.85	----------	----------	2,041,613	7.86
Egg	4,333,944	8.09	11,234,484	8.10	30,015,804	8.15	45,611,898	8.13	175,304	8.14	----------	----------	45,787,202	8.13
Stove	15,994,909	8.64	30,918,926	8.64	70,984,335	8.57	118,004,258	8.60	424,971	7.53	----------	----------	118,429,229	8.59
Chestnut	[5]16,143,192	[5]8.13	31,992,759	8.11	63,241,920	8.13	[5]111,484,634	[5]8.12	[5]685,482	[5]6.93	[6]801	[6]5.38	112,170,917	8.12
Pea	[5]3,051,721	[5]4.57	6,189,657	4.43	11,314,317	4.87	[5]20,577,784	[5]4.69	[5]281,484	[5]3.98	----------	----------	20,859,268	4.68
Total domestic	[5]39,649,944	[5]7.84	81,162,086	7.79	176,637,551	7.96	[5]297,712,587	[5]7.90	[5]1,574,841	[5]6.34	[6]801	[6]5.38	299,288,229	7.89
Buckwheat No. 1	[5]3,187,132	[5]2.76	6,480,811	2.60	11,200,063	2.91	[5]20,870,906	[5]2.78	[5]415,718	[5]2.71	2,163	1.11	21,288,787	2.78
Buckwheat No. 2 (rice)	[5]972,389	[5]1.66	2,046,195	1.58	3,791,759	1.76	[5]6,811,443	[5]1.69	[5]259,503	[5]1.61	----------	----------	7,070,946	1.68
Buckwheat No. 3 (barley)	[5]866,717	[5]1.26	2,052,213	1.18	1,718,301	1.39	[5]4,637,731	[5]1.27	[5]291,845	[5]1.21	243,958	.87	5,173,534	1.24
Boiler	----------	----------	14,254	.28	7,054	.68	28,438	.43	99	.65	6,526	.50	35,063	.44
Other	20,837	.38	96,895	.60	390,274	1.59	508,106	1.10	42,141	.51	14,992	.45	565,239	.98
Total steam	[5]5,047,075	[5]2.03	10,690,368	1.86	17,107,451	2.28	[5]32,856,624	[5]2.09	[5]1,009,306	[5]1.58	267,639	0.82	34,133,569	2.05
Grand total	[5]44,697,019	[5]5.93	91,852,454	5.69	193,745,002	6.52	330,569,211	[5]6.19	[5]2,584,147	[5]2.91	268,440	0.82	333,421,798	6.10

[1] Value given is value at which coal left possession of producing company f. o. b. mines and does not include margins of separately incorporated selling companies.

[2] The quantity of lump included is insignificant.

[3] A small amount of buckwheat No. 1 is included with buckwheat No. 2.

[4] A small amount of boiler coal is included with "Other" sizes.

[5] A small amount of washery product is included with breaker product to avoid disclosing operators' figures.

[6] Includes some pea coal.

TRENDS IN SIZES SHIPPED

Details of the quantity and value of each size shipped in 1929 and 1930 are given by regions in Tables 14A and 15A. Table 16A shows the relative percentage of each size in the total shipments of breaker coal from 1923 to 1930.

The total shipments of steam sizes, including dredge and washery coal, declined from 17,100,896 tons in 1929 to 16,691,044 tons in 1930, a decrease of 2.4 per cent. Shipments of domestic sizes, on the other hand, declined 3,244,185 tons, or 7.9 per cent, from the previous year.

Within the group of domestic sizes the relative proportions of each size are affected by changes in the standards of sizing that have been made from time to time. In view of certain revisions undertaken in 1925, the recommendation for further improvement of preparation standards in 1928, and constantly tightening inspection rules resulting in more and more accurate sizing uniformity, special interest attaches to a comparison between the relative proportions of the five principal domestic sizes in 1928, those in four preceding years, and those in 1929 and 1930. The following figures, abstracted from Table 16A, represent percentages of the total breaker shipments for the years given:

	1923	1924	1926	1927	1928	1929	1930
Broken	5.0	2.7	1.6	1.0	0.7	0.6	0.5
Egg	15.7	14.5	13.5	11.7	11.7	11.4	10.5
Stove	19.6	22.2	25.1	25.9	25.6	25.8	25.7
Chestnut	25.6	26.5	27.1	26.4	25.4	25.6	25.7
Pea	8.0	8.3	5.5	6.2	7.8	8.1	8.2

TABLE 16A.—*Sizes of anthracite shipped from breakers, by regions, 1923–1930, in per cent of total*

[Note that shipments of dredge and washery coal are not included]

Region and size of coal	Per cent of total shipments							
	1923	1924	1925	1926	1927	1928	1929	1930
Lehigh:								
Lump	-------	-------	-------	(1)	(2)	-------	(1)	(1)
Broken	1.7	1.0	1.1	0.5	[2]0.4	0.2	0.2	0.2
Egg	14.7	13.1	11.5	9.3	7.8	8.0	7.5	7.1
Stove	17.8	19.6	22.0	21.9	23.2	23.7	24.8	24.6
Chestnut	25.4	26.1	26.9	25.8	25.9	26.6	26.4	26.3
Pea	9.6	9.5	7.4	7.5	7.9	9.2	9.2	8.9
Total domestic	69.2	69.3	68.9	65.0	65.2	67.7	68.1	67.1
Buckwheat No. 1	14.3	13.7	12.8	11.7	12.7	13.4	13.7	15.3
Buckwheat No. 2 (rice)	7.4	7.1	7.6	7.3	8.4	8.5	7.7	7.8
Buckwheat No. 3 (barley)	7.7	8.7	8.6	10.7	10.8	9.4	9.9	9.1
Boiler	.2	(1)	(1)	2.0	-------	-------	-------	-------
Other	1.2	1.2	2.1	3.3	2.9	1.0	.6	.7
Total steam	30.8	30.7	31.1	35.0	34.8	32.3	31.9	32.9
Schuylkill:								
Lump	.1	.1	(1)	(1)	(2)	-------	(1)	(1)
Broken	3.5	1.7	1.5	.9	[2].8	.6	.8	.6
Egg	12.5	11.6	10.0	10.4	9.9	8.9	8.9	8.6
Stove	18.0	20.6	22.3	23.5	21.8	22.5	22.7	22.2
Chestnut	23.3	24.3	24.9	26.0	25.0	24.1	24.5	24.4
Pea	10.0	10.1	7.5	7.3	7.2	8.6	8.3	8.7
Total domestic	67.4	68.4	66.2	68.1	64.7	64.7	65.2	64.5

[1] Less than one-tenth of 1 per cent.

[2] A small amount of lump coal is included with broken.

TABLE 16A.—*Sizes of anthracite shipped from breakers, by regions, 1923–1930, in per cent of total*—Continued

Region and size of coal	Per cent of total shipments							
	1923	1924	1925	1926	1927	1928	1929	1930
Schuylkill—Continued.								
Buckwheat No. 1	16.9	15.4	14.4	12.8	15.0	15.7	15.6	15.4
Buckwheat No. 2 (rice)	6.4	5.7	7.9	8.1	8.2	7.5	7.1	8.0
Buckwheat No. 3 (barley)	8.5	9.8	10.5	9.9	10.6	10.6	10.4	10.8
Boiler	(1)	(1)	(1)	.1	(1)	(1)	.2	.3
Other	.8	.7	1.0	1.0	1.5	1.5	1.5	1.0
Total steam	32.6	31.6	33.8	31.9	35.3	35.3	34.8	35.5
Wyoming:								
Lump	--------	--------	--------	--------	--------	--------	--------	--------
Broken	6.6	3.6	3.6	2.2	1.3	.7	.6	.5
Egg	17.7	16.2	15.8	16.0	13.5	14.1	13.6	12.4
Stove	20.9	23.5	25.9	26.7	28.7	27.7	27.5	27.9
Chestnut	[3] 26.8	[3] 27.8	[3] 27.6	[3] 27.9	27.3	25.9	25.9	26.2
Pea	6.5	7.1	4.2	4.1	5.3	7.1	7.7	7.8
Total domestic	78.5	78.2	77.1	76.9	76.1	75.5	75.3	74.8
Buckwheat No. 1	10.6	10.5	11.3	10.8	11.8	11.9	12.0	13.0
Buckwheat No. 2 (rice)	6.5	6.7	7.2	7.5	7.1	7.8	7.3	7.2
Buckwheat No. 3 (barley)	3.8	3.8	3.6	3.9	4.1	4.3	4.6	4.2
Boiler	.2	.2	.1	.2	.1	.1	.1	(1)
Other	.4	.6	.7	.7	.8	.4	.7	.8
Total steam	21.5	21.8	22.9	23.1	23.9	24.5	24.7	25.2
Grand total (including Sullivan County):								
Lump	(1)	(1)	(1)	(1)	(2)	--------	(1)	(1)
Broken	5.0	2.7	2.6	1.6	[2] 1.0	.7	.6	.5
Egg	15.7	14.5	13.5	13.5	11.7	11.7	11.4	10.5
Stove	19.6	22.2	24.4	25.1	25.9	25.6	25.8	25.7
Chestnut	[3] 25.6	[3] 26.5	[3] 26.8	[3] 27.1	26.4	25.4	25.6	25.7
Pea	8.0	8.3	5.6	5.5	6.2	7.8	8.1	8.2
Total domestic	73.9	74.2	72.9	72.8	71.2	71.2	71.5	70.6
Buckwheat No. 1	12.9	12.3	12.4	11.4	12.8	13.2	13.2	14.0
Buckwheat No. 2 (rice)	6.6	6.5	7.4	7.6	7.6	7.8	7.3	7.6
Buckwheat No. 3 (barley)	5.7	6.1	6.2	6.5	6.9	6.8	7.0	6.8
Boiler	.2	.1	.1	.5	.1	.1	.1	.1
Other	.7	.8	1.0	1.2	1.4	.9	.9	.9
Total steam	26.1	25.8	27.1	27.2	28.8	28.8	28.5	29.4

[1] Less than one-tenth of 1 per cent.
[2] A small amount of lump coal is included with broken.
[3] Includes range coal.

A summary of shipments by sizes for the last 12 years is given in Table 17A. In comparison with 1929 the percentage of pea in breaker shipments for 1930 increased slightly, and the percentage of sizes below pea increased to 29.4 per cent. The percentage of sizes above pea declined to 62.4 per cent. The total shipments, which include dredge and washery coal, showed much the same tendency in 1930 as in 1929.

One of the practical problems of the anthracite industry concerns the gradual shrinking of the proportion of domestic sizes, which are commonly referred to among the operators as the profitable sizes. In the past 8 years the proportion of the broken and egg sizes has decreased from about 20 per cent to only 11 per cent, due to changes in both industrial and domestic consumption practice. Necessarily, this decrease has resulted in a larger proportion of the smaller sizes, particularly of so-called unprofitable or steam sizes, although of course the proportion of the most popular domestic sizes—stove and chestnut—has also increased from a total of about 45 per cent to over 51 per cent.

The problem presented to the industry is evident—to overcome the effect on profits of the shift from 73 per cent of so-called profitable sizes and 27 per cent of unprofitable to only 69.5 per cent of profitable and 30.5 per cent of unprofitable sizes. The industry is seriously attacking this and other problems. (See discussion on pp. 734–740.)

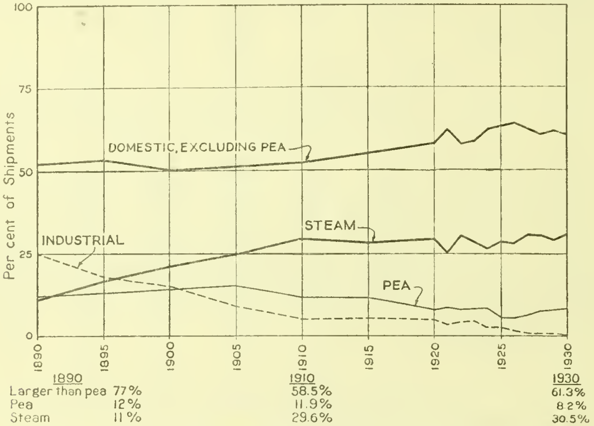

FIGURE 51.—Changing percentages of industrial, domestic, pea, and steam sizes of anthracite, 1890–1930

The above graph, Figure 51, illustrates the changing picture since 1890, based on total shipments from all operations.

TABLE 17A.—*Shipments of anthracite from breakers and total from all operations, classified by sizes, 1919–1930*

[A table separating shipments of domestic sizes from pea and steam for each year from 1890 to 1924, excluding, however, Sullivan County and dredge coal, will be found in Coal in 1924, p. 575]

	Sizes above pea		Pea		Sizes below pea		Total (gross tons)
	Gross tons	Percentage of total	Gross tons	Percentage of total	Gross tons	Percentage of total	
Breaker product:							
1919	42,937,454	66.4	5,884,492	9.1	15,809,757	24.5	64,631,703
1920	42,209,170	66.4	5,008,050	7.9	16,381,463	25.7	63,598,683
1921	45,796,115	67.4	5,720,904	8.4	16,464,397	24.2	67,981,416
1922	25,046,679	66.1	2,967,355	7.8	9,892,469	26.1	37,906,503
1923	45,651,693	65.9	5,544,915	8.0	18,091,818	26.1	69,288,426
1924	44,566,747	65.9	5,593,926	8.3	17,431,597	25.8	67,592,270
1925	31,359,250	67.3	2,608,744	5.6	12,647,429	27.1	46,615,423
1926	44,301,428	67.3	3,636,137	5.5	17,888,624	27.2	65,826,189
1927	39,732,320	65.0	3,780,481	6.2	17,617,143	28.8	61,129,944
1928	36,550,918	63.4	4,503,801	7.8	16,580,787	28.8	57,635,506
1929	36,325,442	63.4	4,636,115	8.1	16,363,354	28.5	57,324,911
1930	33,313,801	62.4	4,391,195	8.2	15,723,431	29.4	53,428,427
Total shipments:[1]							
1919	43,349,551	63.8	6,237,398	9.2	18,385,346	27.0	67,972,295
1920	42,984,656	62.6	5,457,588	8.0	20,168,519	29.4	68,610,763
1921	46,051,199	66.2	5,865,379	8.4	17,637,985	25.4	69,554,563
1922	25,409,723	61.8	3,278,136	8.0	12,385,979	30.2	41,073,838
1923	46,479,297	63.3	5,928,618	8.1	21,019,797	28.6	73,427,712
1924	44,825,550	65.0	5,689,000	8.2	18,456,431	26.8	68,970,981
1925	31,518,719	65.7	2,682,372	5.6	13,806,384	28.7	48,007,475
1926	44,601,096	66.3	3,699,294	5.5	18,948,556	28.2	67,248,946
1927	39,861,493	63.3	3,887,666	6.2	19,193,061	30.5	62,942,220
1928	36,669,756	61.8	4,596,675	7.7	18,097,498	30.5	59,363,929
1929	36,510,978	62.6	4,686,857	8.1	17,100,896	29.3	58,298,731
1930	33,491,781	61.3	4,461,869	8.2	16,691,044	30.5	54,644,694

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[1] Includes shipments of washery and dredge coal.

At this point it should be noted that the classifications used in the preceding tables are not always the same. Tables 14A, 15A, and the second half of 17A include all anthracite shipments. Table 16A and the first half of 17A include all shipments from breakers and exclude dredge and washery coal. These differences should be kept in mind when comparisons are made.

LOCAL SALES

Shipments to points outside the mining area absorb most of the production of anthracite and provide most of the industry's gross revenue, but considerable tonnages are also sold in the thriving communities within the anthracite region itself. These "local sales" (as they are designated in the tables of this report) plus the shipments constitute the commercial or revenue-producing part of the production.

Local sales in 1930 amounted to 2,807,530 tons, or 4.5 per cent of the total output. Although the tonnage of local sales decreased 79,098 tons, the percentage of the total output gained 0.1 per cent over 1929. In 1913 local sales amounted to 1,793,814 tons; in 1919, to 2,107,876 tons; and in 1923, to 2,900,314 tons. In recent years they constitute 3 to 4 per cent of the total production, as against 2.4 per cent before the war. Although the quantity of anthracite sold locally generally has increased during the past 10 years, at least a part of the year-to-year fluctuations in the proportion of total output represented by local sales is explained by changes in the output.

TABLE 18A.—*Disposition of total output of anthracite, 1890–1930, in per cent*

Year	Shipments	Local sales	Colliery fuel	Year	Shipments	Local sales	Colliery fuel
1890	88.3	4.3	7.4	1922	84.1	4.4	11.5
1895	89.8	2.3	7.9	1923	88.1	3.5	8.4
1900	88.4	2.1	9.5	1924	87.8	3.5	8.7
1905	88.9	2.0	9.1	1925	87.0	4.7	8.3
1910	87.1	2.4	10.5	1926	89.2	3.2	7.6
1915	86.4	2.4	11.2	1927	88.0	3.8	8.2
1919	86.4	2.7	10.9	1928	88.3	4.2	7.5
1920	85.8	3.2	11.0	1929	88.4	4.4	7.2
1921	86.1	3.1	10.8	1930	88.2	4.5	7.3

To throw light on the character of the local market the Bureau of Mines addressed a supplementary inquiry to each producer asking for a statement of the sizes sold locally. The data thus obtained are tabulated for 1928, 1929, and 1930 to show local sales of breakers and washeries and of dredges (Table 19A).

TABLE 19A.—*Sales of anthracite, by sizes, made locally by operators of breakers, washeries, and dredges, 1928–1930*

Size	1928		1929		1930	
	Gross tons	Per cent of total	Gross tons	Per cent of total	Gross tons	Per cent of total
Breakers and washeries						
Lump	58	(1)	1,460	0.1		
Broken	19,923	0.8	24,881	1.0	22,566	0.9
Egg	15,914	.7	19,555	.8	22,911	.9
Stove	77,934	3.2	80,385	3.3	105,074	4.2
Chestnut	796,313	33.0	750,024	30.4	710,252	28.3
Pea	751,890	31.2	844,455	34.2	906,804	36.2
Buckwheat No. 1	349,069	14.5	338,445	13.7	340,270	13.6
Buckwheat No. 2	194,857	8.1	187,952	7.6	222,622	8.9
Buckwheat No. 3	147,603	6.1	164,306	6.7	118,727	4.7
Boiler	55,237	2.3	51,839	2.1	51,619	2.0
Other	2,081	.1	2,945	.1	7,377	.3
	2,410,879	100.0	2,466,247	100.0	2,508,222	100.0
Total local sales from breakers and washeries	2,497,709		2,537,168		2,562,372	
Percentage of total local sales accounted for, by sizes		96.5		97.2		97.9
Dredges						
Egg						
Stove	193	0.1	129	(1)	34	(1)
Chestnut	644	.2	160	(1)	120	0.1
Pea	1,739	.6	1,344	0.4	488	.2
Buckwheat No. 1	7,320	2.4	10,252	3.1	3,439	1.5
Buckwheat No. 2	7,406	2.5	14,218	4.1	12,777	5.5
Buckwheat No. 3	22,800	7.5	25,275	7.3	3,630	1.6
Boiler	69,499	22.9	96,122	27.8	69,846	30.1
Other [2]	193,536	63.8	198,069	57.3	141,331	61.0
	303,137	100.0	345,569	100.0	231,665	100.0
Total local sales from dredges	345,885		349,460		245,158	
Percentage of total local sales accounted for, by sizes		87.6		98.9		94.5

[1] Less than one-tenth of 1 per cent.

[2] Mainly unsized river coal.

Local sales from breakers and washeries are seen to consist largely of chestnut, pea, and buckwheat No. 1. Chestnut comprised 25.7 per cent of the total breaker shipments outside the region in 1930 and 28.3 per cent of the local sales of companies reporting. Pea formed only 8.2 per cent of the breaker shipments but comprised 36.2 per cent of the local sales of the companies reporting. Buckwheat No. 1, which comprised 13.6 per cent of the local sales, formed 14 per cent of the breaker shipments. Between 1928 and 1930 the local sales of pea increased over 150,000 tons, or from 31.2 to 36.2 per cent of total local sales. The large proportion of pea and buckwheat, nearly 50 per cent of all local sales within the region, helps to explain the lower average value of local sales as compared with the value of shipments. In 1930, 245,158 tons, or 42.8 per cent, of the total output of dredge coal were sold locally. Steam sizes comprised all but a small quantity of this tonnage.

TRENDS IN VALUES AND PRICES

SOURCES OF INFORMATION AND METHODS OF ANALYSIS

Margins of sales agents not included.—The valuation figures in this study represent value at the breaker or washery, as reported by the operating companies. In making its report the company is requested to "estimate value of the product not sold" and to "exclude selling expenses."

From this it will be seen that where a producing company sells its output to a separately organized sales company—the practice of many, including certain of the largest producers—the value reported will exclude the margin of the sales company and may therefore be somewhat less than the circular price at which the coal in question is placed on the general market. One should bear this fact in mind in considering the variations between different regions shown in the tables for the same sizes of coal.[18] (Table 20A.)

Estimates included in figures of value.—The reports are furnished in writing and signed by responsible officials of the mining companies. Complete reports have been received from all operators as to tonnage produced and physical operation of the mines. A few companies made no reply on the value of the product, however, and, to round out the totals, estimates of these values have been made. The estimates represent only 13.3 per cent of the value shown in 1930 because, aside from a few extremely small producers, only one company failed to report. The values for this company, a producer in the Wyoming region, were estimated in 1930 as follows: The tonnage it reported of each size from broken to pea was multiplied by the company's average circular price for that size, as quoted in the trade journals for the year. The tonnage that it reported for buckwheat No. 1 and each smaller size was multiplied by the average sales realization obtained on that size by all other producers in the Wyoming region.

This method of computation gives exactly comparable results for the years 1926, 1927, 1928, and 1929, with a single exception (buckwheat No. 1 in 1926). Before 1926 a different method of computation was used. The change in method introduced a slight break in the comparability of the figures, the extent of which was fully discussed in Coal in 1926, pages 576 to 580.

The 1930 figures of realization per ton, by sizes, are on a slightly different basis from those in preceding years. Beginning with this year, a merger of two large producers took place. In previous years the smaller of these two producers had sold its output direct, while the larger company distributed through a separately organized sales company. Beginning in 1930, therefore, the report as to valuation of the coal produced by the smaller company is combined with that of the larger company; necessarily, the figures are on a somewhat different basis, due to the fact that the smaller company had previously reported its sales value, which included its selling expenses, whereas beginning with this year its valuation was reported on a mine basis. While this results in average realization figures that are not strictly comparable with previous years, the difference is not serious. (See Table 20A, footnote 2.)

AVERAGE SALES REALIZATIONS, 1923–1930

The average sales realizations on each size from 1923 to 1930 are given in Table 20A. To insure comparability, the table is based on shipments of breaker coal only, the dredge and washery product being excluded.

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[18] See Gordon, E. B., Distribution of Anthracite: U. S. Coal Commission Rept., 1925, pt. 2, pp. 677, 681, and 682, for a statement of the marketing arrangements of the principal companies and the quantities handled through sales agents.

Further declines on domestic sizes.—Average realizations on each of the domestic sizes, which, with the exception of pea, had increased from 1923 to 1926, have decreased steadily during the last three years. (Table 20A.) Each of the domestic grades except pea shows a drop in value in 1930. In comparison with 1929 the reductions ranged from 5 cents a ton on egg to 12 cents a ton on both stove and chestnut, whereas the average realization on pea increased 8 cents per ton. On all domestic sizes combined, including pea, the decrease from 1929 to 1930 was 10 cents a ton. (Of this, the Pennsylvania tax accounted for 5 cents.)

Prices of pea coal.—From 1921 to 1923 pea brought increasing returns, the average receipts rising from $5.74 in 1921 to $6.18 in 1923. Thereafter, prices dropped to $5.60 in 1924 and $5.27 in 1925. In the next two years sales realizations were $5.98 and $5.90, respectively, but the sharp reduction of 90 cents in 1928 meant a decrease of at least $3,500,000 to the industry. In 1929 the average realization on pea was $4.66, a decline of 34 cents as compared with the average for 1928, whereas in 1930 a slight increase of 3 cents was realized.

Prices of steam sizes in 1930.—In 1930 the decline in the price of domestic sizes was partly offset by a substantial increase of 15 cents a ton on buckwheat No. 1. For all steam sizes combined the increase from 1929 to 1930 was only 5 cents a ton, both buckwheat No. 2 and buckwheat No. 3 showing decreases—8 and 6 cents, respectively. The prices on buckwheat Nos. 2 and 3 were lower than in any year since 1920. The average realizations on steam sizes, computed in a manner exactly comparable from year to year, have been as follows:

	1923	1924	1925	1926	1927	1928	1929	1930[1]
Buckwheat No. 1	$3.48	$2.94	$2.49	[2] $2.39	$2.56	$2.75	$2.63	$2.78
Buckwheat No. 2 (rice)	2.23	1.93	1.84	1.78	1.78	1.85	1.77	1.69
All steam sizes	2.64	2.25	2.00	[2] 1.88	1.98	2.12	2.04	2.09

[1] In 1930 one large producer was merged with another and larger producer, with a resulting change in method of reporting values. This is fully explained in footnote 2 under Table 20A.

[2] These figures differ from the corresponding ones in Table 20A, in computing which the value of the buckwheat No. 1 shipped by one large company in the Wyoming region was taken at the company's circular price. The figures for 1926 here given are computed by taking the value of this company's tonnage at the average sales realization obtained by other shippers in the Wyoming region.

TABLE 20A.—*Average sales realization per gross ton on anthracite shipments from breakers, by regions and sizes, 1923–1930*

[Value does not include margins of separately incorporated sales companies]

Region and size of coal	1923	1924	1925	1926	1927	1928	1929	1930
Lehigh:								
Lump	--------	--------	--------	$8.60	(1)	--------	(1)	(1)
Broken	$8.01	$8.32	$8.04	8.39	[1] $8.29	$8.04	[1] $7.96	[1] [2] $7.68
Egg	8.69	8.78	8.61	9.03	8.48	8.35	8.21	[2] 8.09
Stove	8.65	9.10	9.02	9.34	8.98	8.75	8.65	[2] 8.64
Chestnut	8.60	8.95	8.65	8.93	8.46	8.32	8.31	[2] 8.14
Pea	6.34	5.90	5.48	6.10	6.02	5.01	4.60	[2] 4.57
Total domestic	8.31	8.53	8.41	8.75	8.35	8.02	7.92	[2] 7.84
Buckwheat No. 1	3.60	2.96	2.53	2.38	2.53	2.73	2.61	[2] 2.76
Buckwheat No. 2 (rice)	2.49	2.08	1.92	1.85	1.91	1.91	1.82	[2] 1.66
Buckwheat No. 3 (barley)	1.55	1.48	1.45	1.40	1.40	1.40	1.33	[2] 1.27
Total steam[3]	2.70	2.25	1.95	1.72	1.86	2.05	1.98	[2] 2.04
Total, all sizes	6.58	6.61	6.40	6.29	6.09	6.09	6.02	[2] 5.93

Footnotes at end of table.

TABLE 20A.—*Average sales realization per gross ton on anthracite shipments from breakers, by regions and sizes, 1923–1930*—Continued

Region and size of coal	1923	1924	1925	1926	1927	1928	1929	1930
Schuylkill:								
Lump	$8.35	$5.18	$8.85	$9.32	(1)	--------	(1)	(1)
Broken	8.79	8.71	8.67	9.25	[1]$8.88	$8.58	[1]$8.17	[1]$7.97
Egg	8.85	8.75	8.62	9.04	8.42	8.38	8.27	8.10
Stove	8.87	9.16	9.06	9.36	9.00	8.81	8.79	8.64
Chestnut	8.86	9.00	8.75	9.04	8.48	8.38	8.24	8.11
Pea	6.35	5.68	5.30	6.05	5.93	4.96	4.55	4.43
Total domestic	8.49	8.50	8.45	8.83	8.37	8.07	7.96	7.79
Buckwheat No. 1	3.43	2.69	2.38	2.34	2.49	2.65	2.50	2.60
Buckwheat No. 2 (rice)	2.18	1.91	1.79	1.68	1.65	1.77	1.70	1.58
Buckwheat No. 3 (barley)	1.35	1.23	1.22	1.25	1.25	1.36	1.29	1.18
Total steam[3]	2.57	2.04	1.83	1.77	1.84	1.99	1.88	1.86
Total, all sizes	6.56	6.46	6.21	6.59	6.06	5.92	5.85	5.69
Wyoming:								
Lump	--------	--------	--------	--------	--------	--------	--------	--------
Broken	7.57	7.73	7.78	7.96	7.94	7.89	7.78	[2]7.80
Egg	8.31	8.29	8.27	8.62	8.31	8.31	8.15	[2]8.15
Stove	8.40	8.50	8.63	9.01	8.78	8.68	8.71	[2]8.57
Chestnut	[4]8.35	[4]8.34	[4]8.31	[4]8.59	8.31	8.27	8.24	[2]8.13
Pea	5.96	5.45	5.14	5.89	5.83	5.01	4.74	[2]4.87
Total domestic	8.09	8.08	8.21	8.58	8.31	8.12	8.03	[2]7.96
Buckwheat No. 1	3.48	3.11	2.55	2.66	2.61	2.82	2.72	[2]2.91
Buckwheat No. 2 (rice)[5]	2.18	1.91	1.85	1.81	1.82	1.88	1.80	[2]1.76
Buckwheat No. 3 (barley)	1.40	1.29	1.38	1.34	1.37	1.40	1.38	[2]1.39
Total steam[3]	2.67	2.40	2.15	2.13	2.13	2.24	2.17	[2]2.28
Total, all sizes	6.92	6.85	6.83	7.10	6.83	6.68	6.58	[2]6.52
Total, including Sullivan County:								
Lump	8.35	5.18	8.85	9.32	(1)	--------	(1)	(1)
Broken	7.85	7.93	7.94	8.19	[1]8.17	8.10	[1]7.93	[1 2]7.86
Egg	8.49	8.45	8.39	8.75	8.35	8.33	8.18	[2]8.13
Stove	8.56	8.74	8.79	9.14	8.86	8.72	8.72	[2]8.60
Chestnut	[4]8.53	[4]8.59	[4]8.48	[4]8.75	8.38	8.31	8.25	[2]8.13
Pea	6.18	5.60	5.27	5.98	5.90	5.00	4.66	[2]4.69
Total domestic	8.23	8.25	8.30	8.66	8.33	8.09	8.00	[2]7.90
Buckwheat No. 1	3.48	2.94	2.49	2.52	2.56	2.75	2.63	[2]2.78
Buckwheat No. 2 (rice)[5]	2.23	1.93	1.84	1.78	1.78	1.85	1.77	[2]1.69
Buckwheat No. 3 (barley)	1.41	1.30	1.32	1.32	1.32	1.38	1.33	[2]1.27
Total steam[3]	2.64	2.25	2.00	1.94	1.98	2.12	2.04	[2]2.09
Total, all sizes	6.77	6.70	6.59	6.84	6.50	6.38	6.30	[2]6.19

[1] An insignificant quantity of lump is included with the broken coal.

[2] In 1930 a producer in the Lehigh and Wyoming regions, which formerly sold its output direct, was merged with a larger producer selling through a separately incorporated sales company. As the values do not include margins of separately incorporated sales companies, the averages for 1930, as reported above, are not exactly comparable with those for other years. The discrepancy, however, is not serious, as is readily shown by recalculating the averages on the assumption that the 1930 tonnage of the company in question was sold at prices which bore the same percentage of change to its 1929 prices as the 1930 prices of all other producers in the the region bore to their 1929 prices. On this assumption the 1930 averages for all companies would be as follows, the figures being exactly comparable with earlier years:

Region	Broken	Egg	Stove	Chestnut	Pea	Total domestic	Buckwheat No. 1	Total steam	All sizes
Lehigh	$7.66	$8.10	$8.69	$8.16	$4.51	$7.86	$2.74	$2.03	$5.95
Wyoming	7.92	8.20	8.66	8.18	4.77	8.00	2.85	2.25	6.55
All regions	7.92	8.16	8.66	8.16	4.62	7.93	2.75	2.07	6.20

[3] Includes all other steam sizes.

[4] Includes range coal.

[5] Includes bird's-eye coal.

Average value for all sizes.—The average realization on breaker shipments in 1930, all sizes combined, was $6.19 per ton. This average was the lowest realized by anthracite operators since 1921, when the figure reached $6.27 on its steady upward march from 1916 to

1923. The downward trend during the past four years is a striking contrast. (See Table 20A.)

AVERAGE VALUES OF SHIPMENTS, LOCAL SALES, AND COLLIERY FUEL

Table 21A shows by regions the average value per ton for all shipments, all local sales, and colliery fuel in each year from 1919 to 1930. The receipts from local sales average distinctly less than those from shipments, a difference mainly accounted for by the large proportion of the smaller sizes in the local sales. (See Table 19A.) In 1930 shipments brought $6.10 and local sales $4.85, or $1.25 less.

The figures in the following table include the sales of dredge and washery coal as well as breaker coal.

TABLE 21A.—*Average value per gross ton of anthracite shipped, local sales, used for power, and total production, by regions, 1919–1930*[1]

Year and region	Shipments	Local sales	Used for power	Total	Year and region	Shipments	Local sales	Used for power	Total
1919					1925				
Lehigh	$4.86	$3.37	$1.80	$4.51	Lehigh	$6.24	$4.49	$1.57	$5.72
Schuylkill	4.94	3.43	.85	4.31	Schuylkill	5.98	4.06	.42	5.29
Wyoming	5.21	4.55	1.55	4.85	Wyoming	6.78	6.01	1.12	6.37
Sullivan County	4.63	4.70	2.29	4.36	Sullivan County	5.49	6.93	1.85	5.05
	5.08	3.98	1.32	4.64		6.47	5.06	.88	5.94
1920					1926				
Lehigh	5.88	3.29	1.94	5.34	Lehigh	6.29	4.85	2.34	6.01
Schuylkill	5.70	4.14	.90	4.99	Schuylkill	6.41	3.98	.93	5.77
Wyoming	6.15	5.17	1.80	5.71	Wyoming	7.05	5.77	1.46	6.63
Sullivan County	5.60	5.71	2.33	5.27	Sullivan County	5.90	7.06	1.08	5.23
	5.97	4.44	1.47	5.43		6.76	4.95	1.35	6.29
1921					1927				
Lehigh	6.13	3.50	1.59	5.54	Lehigh	6.04	4.49	2.40	5.73
Schuylkill	6.03	4.19	.65	5.22	Schuylkill	5.77	4.14	.42	5.13
Wyoming	6.29	5.64	1.27	5.82	Wyoming	6.79	5.72	1.30	6.36
Sullivan County	6.21	6.20	2.30	5.53	Sullivan County	4.67	7.03	1.50	4.21
	6.20	4.75	1.08	5.60		6.37	4.97	1.07	5.89
1922					1928				
Lehigh	6.05	3.97	2.34	5.56	Lehigh	6.04	4.83	2.37	5.74
Schuylkill	5.78	4.44	.78	4.98	Schuylkill	5.64	4.07	1.76	5.19
Wyoming	6.52	5.78	1.69	6.02	Wyoming	6.63	5.59	1.44	6.26
Sullivan County	5.22	6.18	2.00	4.84	Sullivan County	5.08	6.86	1.75	4.59
	6.21	5.07	1.38	5.61		6.25	4.98	1.68	5.85
1923					1929				
Lehigh	6.36	3.80	1.77	5.84	Lehigh	5.97	5.34	2.38	5.71
Schuylkill	6.31	3.87	.72	5.63	Schuylkill	5.71	3.91	1.75	5.25
Wyoming	6.81	5.92	1.43	6.40	Wyoming	6.56	5.34	1.48	6.19
Sullivan County	6.81	6.56	2.60	6.73	Sullivan County	5.99	7.39	1.80	5.25
	6.60	4.80	1.21	6.08		6.24	4.85	1.70	5.85
1924					1930				
Lehigh	6.54	4.53	1.68	6.03	Lehigh	[2]5.89	5.67	1.95	5.62
Schuylkill	6.33	4.05	.45	5.57	Schuylkill	5.48	4.20	1.74	5.14
Wyoming	6.81	6.14	.97	6.36	Wyoming	[2]6.50	5.10	1.57	6.08
Sullivan County	5.11	7.15	1.98	5.10	Total, including Sullivan County	[2]6.10	4.85	1.67	5.72
	6.63	5.15	.87	6.08					

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[1] Value given for shipments is value at which coal left possession of producing company f. o. b. mines and does not include margins of separately incorporated selling companies.

[2] The figures for the Lehigh and Wyoming districts are affected by a change in status of one company that formerly sold its output direct, and in 1930 was merged with a larger company selling through a separately incorporated sales company. (See footnote 2, Table 20A.)

NUMBER OF OPERATIONS

The number of anthracite operations in 1930, including breakers, washeries, and dredges, was 296, 1 less than in 1929. There were 6 fewer breakers in operation in the Schuylkill region and 6 fewer in the Wyoming region, while in the Lehigh region 3 more were operated than in 1929. There was no change in Sullivan County, so the net decrease for the entire anthracite field was 9 breakers; however, 4 more washeries and 4 additional dredges were operated. Three of the washeries were in the Wyoming and 1 in the Lehigh region; all 4 additional dredges were operated in the Schuylkill region. In Sullivan County there was no change.

TABLE 22A.—*Number of anthracite breakers, washeries, and dredges active, 1921–1930*[1]

	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Lehigh:										
Breakers	33	32	33	33	32	33	32	31	29	32
Washeries	11	11	12	6	6	1	------	------	------	1
Dredges	1	4	3	3	2	1	2	2	2	2
	45	47	48	42	40	35	34	33	31	35
Schuylkill:										
Breakers	79	78	78	78	76	77	75	74	73	67
Washeries	17	24	26	13	7	11	9	9	7	7
Dredges	59	56	56	45	49	46	43	47	47	51
	155	158	160	136	132	134	127	130	127	125
Wyoming:										
Breakers	130	131	144	133	128	127	126	119	125	119
Washeries	27	34	44	22	22	26	13	15	12	15
Dredges	2	2	1	1	2	2	------	------	------	------
	159	167	189	156	152	155	139	134	137	134
Sullivan County: Breakers	3	2	2	3	2	2	2	2	2	2
Total breakers	245	243	257	247	238	239	235	226	229	220
Total washeries	55	69	82	41	35	38	22	24	19	23
Total dredges	62	62	60	49	53	49	45	49	49	53
Grand total	362	374	399	337	326	326	302	299	297	296

[1] The figures for breakers include a small number of independent mining operations that do not size their own coal.

LABOR STATISTICS

The number of men and boys employed in the anthracite fields in 1929 was 9,180 less than in 1928, and there was a still further falling off in 1930. The total number working in the mines, dredges, and preparation plants, excluding supervisory and office workers, in 1930 was 150,804. This was 697 fewer than in 1929. The total shrinkage in the last four years was 14,582.

In 1930 the working time for those employed was also more irregular—the average working days fell off to 208, as compared with 225 in 1929.

The year was entirely free from labor disturbances of any consequence. The principal event was the signing of the new contract between operators and employees in August, 1930, to extend for 5½ years, or through six winters. The new contract definitely provides means for avoiding strikes; it also permits the question of compensation to be raised at any time but not more than once in any year. Although the successful completion of the agreement was preceded by no strikes or threats of strike and consequently was attended by very little publicity, it is considered to be a most significant event, practically insuring the industry against strikes for the considerable period of 5½ years.

Table 24A clearly illustrates the freedom of anthracite from major labor disturbances. Only 112,398 man-days were lost on account of strikes, as compared with 272,511 in 1929 and 400,682 in 1928. In fact, the loss of time from labor troubles was less in 1930 than in any year since 1918.

The long history of mutual losses, in some years reaching stupendous figures, the realization of the futility of these struggles, particularly the strikes of 1922 and 1925-6, and the recognition of anthracite's economic problem, which requires the closest teamwork, are no doubt partly responsible for the calm of 1930 and the agreement which promises well for its continuance for another 5½ years.

TABLE 23A.—*Men employed and days worked in the anthracite field, by regions, 1929 and 1930*

Region	Average number employed					Total	Average number of days worked
	Surface	Underground					
		Miners and their laborers [1]	Haulage and track	Other	Total		
1929							
Lehigh:							
Breakers	5,134	8,266	1,419	3,772	13,457	18,591	227
Dredges	16					16	180
	5,150	8,266	1,419	3,772	13,457	18,607	227
Schuylkill:							
Breakers	11,397	20,035	3,539	8,007	31,581	42,978	215
Washeries	344					344	121
Dredges	293					293	197
	12,034	20,035	3,539	8,007	31,581	43,615	214
Wyoming:							
Breakers	16,089	48,778	9,890	13,689	72,357	88,446	231
Washeries	242					242	192
	16,331	48,778	9,890	13,689	72,357	88,688	231
Sullivan County: Breakers	130	316	75	70	461	591	98
Total breakers	[2] 32,750	77,395	14,923	25,538	117,856	150,606	225
Total washeries	586					586	150
Total dredges	309					309	196
Grand total	33,645	77,395	14,923	25,538	117,856	151,501	225
1930							
Lehigh:							
Breakers	5,158	8,196	1,365	3,619	13,180	18,338	211
Washeries	27					27	209
Dredges	14					14	162
	5,199	8,196	1,365	3,619	13,180	18,379	211
Schuylkill:							
Breakers	10,903	19,827	3,299	8,168	31,294	42,197	214
Washeries	276					276	201
Dredges	264					264	131
	11,443	19,827	3,299	8,168	31,294	42,737	213

[1] Operators were requested to give number of "all miners (contract, consideration, and company) and their laborers."

[2] Includes a comparatively small number of washery employees who could not be separated from breaker employees.

TABLE 23A.—*Men employed and days worked in the anthracite field, by regions, 1929 and 1930*—Continued

Region	Average number employed						Average number of days worked
	Surface	Underground				Total	
		Miners and their laborers	Haulage and track	Other	Total		
Wyoming:							
Breakers	15,042	50,432	9,006	14,376	73,814	88,856	206
Washeries	250					250	173
	15,292	50,432	9,006	14,376	73,814	89,106	206
Sullivan County: Breakers	120	315	66	81	462	582	65
Total breakers	[2] 31,223	78,770	13,736	26,244	118,750	149,973	208
Total washeries	553					553	189
Total dredges	278					278	132
Grand total	32,054	78,770	13,736	26,244	118,750	150,804	208

[2] Includes a comparatively small number of washery employees who could not be separated from breaker employees.

TABLE 24A.—*Strikes, suspensions, and lockouts in the anthracite regions, 1923–1930*

	Lehigh	Schuylkill	Wyoming	Sullivan County	Total
1923					
Total number employed	20,639	49,350	86,978	776	157,743
Men on strike	18,593	43,524	72,772	696	135,585
Man-days lost account strike	354,830	805,640	1,456,364	12,584	2,629,418
Average days lost:					
Per man employed	17	16	17	16	17
Per man on strike	19	19	20	18	19
1924					
Total number employed	20,331	50,456	88,504	718	160,009
Men on strike	10,145	12,333	48,795		71,273
Man-days lost account strike	151,243	86,429	905,958		1,143,630
Average days lost:					
Per man employed	7	2	10		7
Per man on strike	15	7	19		16
1925					
Total number employed	19,579	50,745	89,399	589	160,312
Men on strike	18,751	45,715	82,876	586	147,928
Man-days lost account strike	1,863,605	4,675,143	8,661,264	69,494	15,269,506
Average days lost:					
Per man employed	95	92	97	118	95
Per man on strike	99	102	105	119	103
1926					
Total number employed	20,133	50,138	94,469	646	165,386
Men on strike	17,074	44,309	83,381	612	145,376
Man-days lost account strike	723,550	1,825,482	3,415,913	25,532	5,990,477
Average days lost:					
Per man employed	36	36	36	40	36
Per man on strike	42	41	41	42	41
1927					
Total number employed	20,253	50,313	94,069	624	165,259
Men on strike	5,073	2,991	12,414		20,478
Man-days lost account strike	20,112	5,771	133,359		159,242
Average days lost:					
Per man employed	1	(1)	1		1
Per man on strike	4	2	11		8
1928					
Total number employed	19,644	48,027	92,458	552	160,681
Men on strike	7,872	1,158	27,098		36,128
Man-days lost account strike	33,720	3,299	363,663		400,682
Average days lost:					
Per man employed	2	(1)	4		2
Per man on strike	4	3	13		11

[1] Less than one-half day.

TABLE 24A.—*Strikes, suspensions, and lockouts in the anthracite regions, 1923–1930*—Continued

	Lehigh	Schuylkill	Wyoming	Sullivan County	Total
1929					
Total number employed	18,607	43,615	88,688	591	151,501
Men on strike	8,433	778	30,566	----------	39,777
Man-days lost account strike	118,832	816	152,863	----------	272,511
Average days lost:					
Per man employed	6	(1)	2	----------	2
Per man on strike	14	1	5	----------	7
1930					
Total number employed	18,379	42,737	89,106	582	150,804
Men on strike	3,845	5,887	8,470	----------	18,202
Man-days lost account strike	13,577	42,826	55,995	----------	112,398
Average days lost:					
Per man employed	1	1	1	----------	1
Per man on strike	4	7	7	----------	6

[1] Less than one-half day.

METHODS OF MINING

Out of the 60,234,270 tons of fresh-mined coal produced in 1930, 1,259,038 tons were mined by machines. (See Table 25A.) Although this is over 100,000 tons more than in 1928 and over 200,000 tons more than in 1929, it is still only 2.1 per cent of the total fresh-mined production.

As has been explained in previous reports, mining conditions in the anthracite region are not favorable for machine cutting. Practically the entire tonnage cut by machine was produced by 167 machines in the Wyoming region. Eight machines were operated in the Schuylkill region and 10 in Sullivan County. In the Wyoming and Sullivan regions the beds are less steeply inclined, and machine mining is possible. No machine mining was reported in the Lehigh region during 1930.

As shown in Table 26A strip mining is carried on in all three of the principal producing regions. The total output by strip mining in 1930 was 2,264,543 tons, an increase of 32.7 per cent over 1929. This tonnage was produced by the same number of shovels that operated in 1928, namely 108, but the production was about 100,000 tons more than in 1928. Of the total anthracite mined by stripping during 1930 the Lehigh and Schuylkill regions produced slightly over 1,000,000 tons each and together accounted for over 90 per cent of the total.

TABLE 25A.—*Anthracite mined by undercutting machines, 1928–1930*

Region	1928		1929		1930	
	Number of machines	Gross tons	Number of machines	Gross tons	Number of machines	Gross tons
Lehigh	1	(1)	----------	----------	----------	----------
Schuylkill	1	(1)	4	13,894	8	(1)
Wyoming	176	[1]1,093,055	118	978,559	167	[1]1,254,038
Sullivan	15	58,560	15	43,181	10	5,000
	193	1,151,615	137	1,035,634	185	1,259,038

[1] Lehigh and Schuylkill included with Wyoming.

TABLE 26A.—*Anthracite recovered from steam-shovel strip pits, 1928–1930*

Region	1928		1929		1930	
	Number of shovels	Gross tons	Number of shovels	Gross tons	Number of shovels	Gross tons
Lehigh	40	1,073,043	39	849,152	31	1,004,940
Schuylkill	45	881,191	35	688,288	44	1,060,324
Wyoming	23	209,091	24	169,494	33	199,279
	108	2,163,325	98	1,706,934	108	2,264,543

DREDGE OPERATIONS

In 1930, 53 dredges reported a production of 574,367 tons, valued at $538,268. The total production, as compared with 1929, decreased 65,762 tons, or 10.3 per cent; the value decreased 14 per cent.

The "river coal" consists chiefly of sizes equivalent to buckwheat No. 3 and boiler. It is sold mainly for steam-raising purposes, and prices obtained for dredge coal have averaged about $1 per gross ton since 1925. During 1930 the average realization was 94 cents, 4 cents less than in the two previous years and only 2 cents higher than the lowest average price of the past nine years, which was 92 cents in 1927.

Average receipts per gross ton on all dredge coal sold

1922	$1.23	1927	$0.92
1923	.95	1928	.98
1924	.94	1929	.98
1925	1.02	1930	.94
1926	1.01		

In the winter dredging is handicapped by cold weather. The seasonal nature of the industry is shown by Table 28A, which gives the number of employees in each month.

TABLE 27A.—*Anthracite produced by dredges, by rivers, 1929 and 1930*

River (including tributaries)	Number of dredges	Gross tons	Value	River (including tributaries)	Number of dredges	Gross tons	Value
1929				1930			
Lehigh	2	77,894	$91,136	Lehigh	2	53,767	$60,434
Schuylkill	11	119,393	123,602	Schuylkill	13	123,425	118,374
Susquehanna	36	442,842	411,449	Susquehanna	38	397,175	359,460
	49	640,129	626,187		53	574,367	538,268

TABLE 28A.—*Number of employees on pay rolls of anthracite-dredge operations on the first day of each month, 1928–1930*

Month	1928	1929	1930	Month	1928	1929	1930
January	110	94	64	July	449	373	238
February	172	89	85	August	385	267	145
March	269	177	215	September	340	232	140
April	381	353	257	October	263	334	131
May	438	418	257	November	211	282	96
June	468	430	215	December	122	130	34

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PETROLEUM[1]

By G. R. Hopkins and A. B. Coons[2]

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SUMMARY

The production of crude petroleum in the United States, which had risen to a new record of more than 1,000,000,000 barrels in 1929, declined materially in 1930. The quantity produced amounted to 898,011,000 barrels, a decrease of 109,312,000 barrels (10.9 per cent) from 1929 and slightly below the outputs in 1928 and 1927.

The substantial decline in production in 1930 was brought about by curtailment, mostly voluntary, in flush fields. Several forms of curtailment were practiced, but the customary type was a proration agreement under which the daily production in a field or district was limited to a certain specified figure. Production in 1930 was also affected by the decline in prices and the natural decline of the older fields; but these had minor importance, and the total output could have been increased if there had been enough demand for crude petroleum. (See fig. 52.)

The production of crude petroleum remained virtually stationary during the first half of the year, despite the usual seasonal increase in

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[1] Work on manuscript completed December, 1931.

[2] Unless otherwise indicated, the tables in this report were prepared by A. B. Coons, M. N. Schellenger, A. L. Clapp, and C. S. Evans, of the Bureau of Mines. Figures on imports and exports were compiled by J. A. Dorsey, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

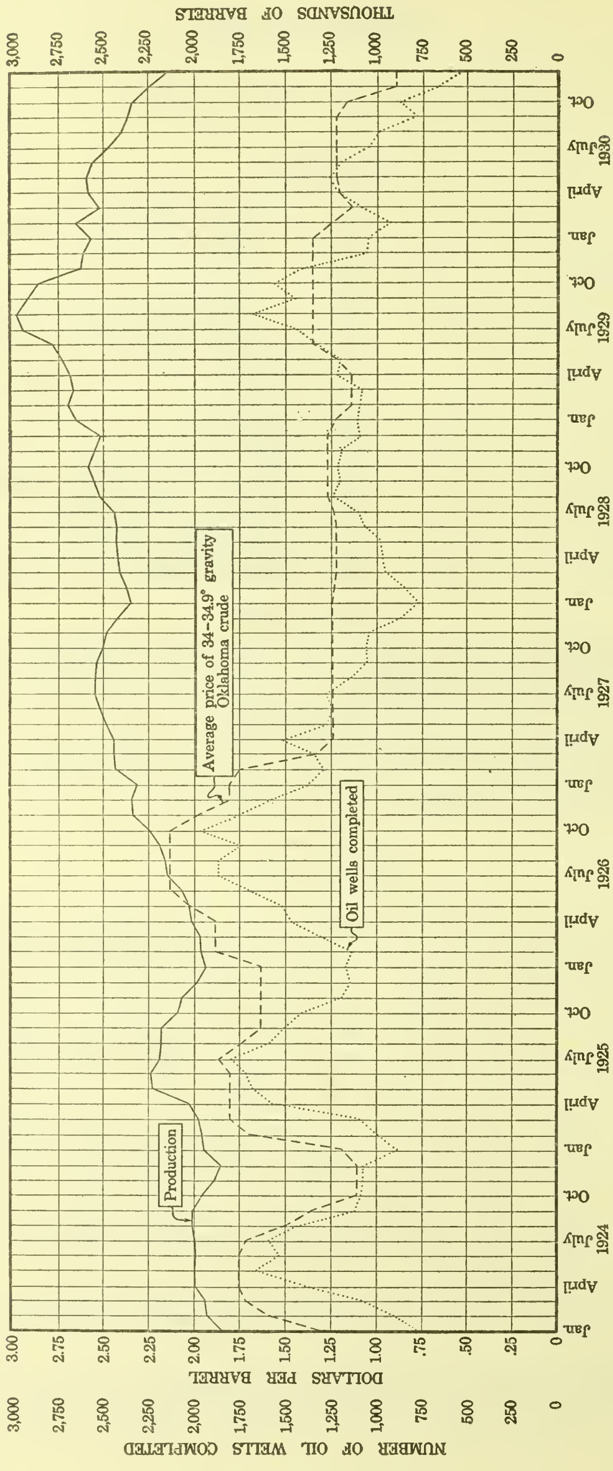

FIGURE 52.—Daily average production of crude petroleum in the United States, total number of oil wells completed, and average price of a selected grade of Oklahoma crude, 1924–1930, by months

demand by refiners. The progress in restricting production made itself felt in the latter half of the year; in consequence, the daily average production during the closing days of the year was lower than at any time since the middle of 1926.

Texas was again the leading producing State in 1930, with an output of 290,457,000 barrels. Production in California fell off materially, coincident with the decline of the flush output in the Santa Fe Springs and Long Beach fields. (See fig. 53.) However, California retained second place ahead of Oklahoma, which was third in production. The output in practically all the other producing States declined also in 1930; the exceptions were Indiana, Louisiana, New Mexico, New York, and Pennsylvania. The gain in output in New Mexico was particularly outstanding and resulted almost solely from development of the Hobbs field in the southeast corner of the State. The increased output in New York and Pennsylvania was due largely to augmented production in the Bradford field, located in both States. By water flooding the Bradford operators have built up a sizable potential, but the actual takings are limited by the market demand. The gain in output in Louisiana resulted primarily from development of the Zwolle field. The material decline in production in Oklahoma was due almost solely to the drop in the Seminole district. The decline in production in the older fields of Oklahoma was partly offset by the gain in the Oklahoma City field, which under rigid proration yielded 34,603,000 barrels in 1930 as compared with 8,710,000 barrels in 1929. West Texas, the leading producing district in Texas, registered a decline of approximately 25,000,000 barrels, which was almost offset by new production obtained from extensions in the Gulf coast fields and from the Darst Creek field, Guadalupe County. Production in Kansas, the State ranking fourth, fell off only slightly, as new discoveries about balanced the decline in the old fields. Production in Wyoming continued to fall as that in Salt Creek, the principal field, again declined.

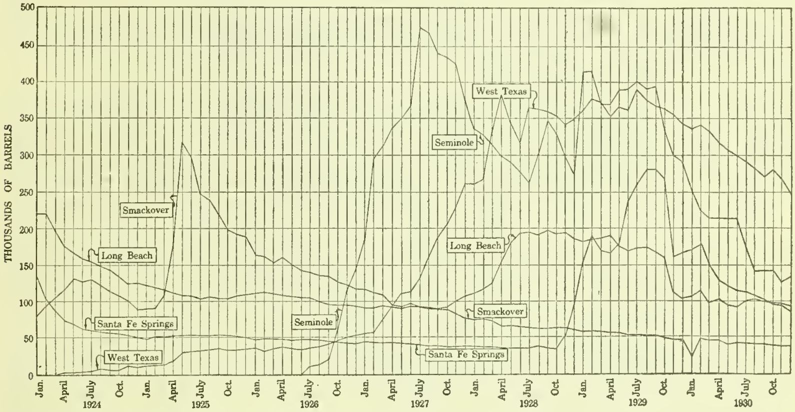

FIGURE 53.—Daily average production of crude petroleum in certain fields, 1924-1930, by months

The world production of crude petroleum in 1930 totaled 1,410,037,000 barrels, 5.1 per cent less that that in 1929. This decline resulted chiefly from the decreased output in the United States, as most of the other nations recorded material gain. The proportion of the total produced in the United States fell from 67.8 per cent in

1929 to 63.7 per cent in 1930. Production in Venezuela declined slightly, but that country retained second place among the producing nations. New records for crude production were established in Russia, Persia, Netherland East Indies, and Rumania, which followed Venezuela in order. Production in Mexico again declined, and that country fell from fourth in 1929 to seventh in 1930.

Imports of crude petroleum declined for the second successive year; the total shipped into this country during 1930 amounted to 62,129,000 barrels, compared with 78,933,000 barrels in 1929. Venezuela continued to supply the major portion of the foreign crude shipped into the United States; imports from Mexico again declined, but those from Colombia again increased. Exports of crude petroleum amounted to 23,704,000 barrels, compared with 26,394,000 barrels in 1929; Canada continued to be the leading customer, with Japan second and Germany third.

The material decrease in output was reflected in crude stocks, which declined in 1930 for the first year since 1926. Stocks of crude petroleum, including fuel oil in California, fell from 535,514,000 barrels on January 1 to 512,230,000 barrels on December 31, a decline of 23,284,000 barrels, in contrast to 1929 when nearly 50,000,000 barrels was added to storage.

Runs to stills of crude petroleum totaled 927,447,000 barrels, a decline of 6 per cent from 1929 and the equivalent of about 97 per cent of the total indicated demand for crude for all purposes, including losses. It was the first time that the annual total of crude runs to stills declined since refinery statistics were first prepared by the Bureau of Mines. The production of gasoline, the principal refined product, was about the same in 1930 as in 1929, but the drop in crude oil processed in 1930 was compensated by a gain in relative yield. In 1929 crude runs reached their peak in August, at the end of the period of heaviest gasoline consumption; in 1930, crude runs were highest in May, at the beginning of the period of highest consumption. This fact indicates that considerably more success attended efforts to balance crude runs against gasoline consumption in 1930 than in 1929.

Declining prices and the general curtailment program restricted drilling; in consequence, the number of oil wells brought in declined from 15,572 in 1929 to 11,640 in 1930. The average daily initial production of the oil wells completed in 1930 established a new record so that in spite of the decrease in drilling the shut-in production showed a material gain. The number of producing wells on December 31, 1930, totaled 331,070, a new record and an increase of 2,870 over the previous year. This gain was considerably higher than that in 1929, indicating that the producers completed the maior portion of the work of plugging unprofitable wells in 1929. Pennsylvania, with 80,560 producing oil wells at the end of 1930, ranks far ahead of the other States in number of wells.

The average production per well per day amounted to 7.5 barrels in 1930, compared with 8.4 barrels in 1929. These averages are not trictly comparable with those of previous years, as curtailment, which has increased steadily, reduces output relatively more than the number of wells and thus tends to lower the average production per well per day.

The average value per barrel at the wells of the crude petroleum produced was $1.19 in 1930, compared with $1.27 in 1929 and with an average of $1.34 from 1859 to 1930. The total value of the crude petroleum produced in 1930 was $1,070,200,000, a decline of 16.4 per cent from that in 1929. This decrease was due mainly to the drop in output, although the loss in revenue due to lower prices was also important. In general, the posted prices for crude were reduced in February. They were increased in April, when refinery consumption was increasing rapidly, but they fell substantially late in the year after the gasoline market had weakened materially. California supplied a notable exception to the declines in posted prices in 1930, the average value at the wells for the State rose from $1.10 in 1929 to $1.20 in 1930. Data on the supply and demand of all oils follows. (See also fig. 54.)

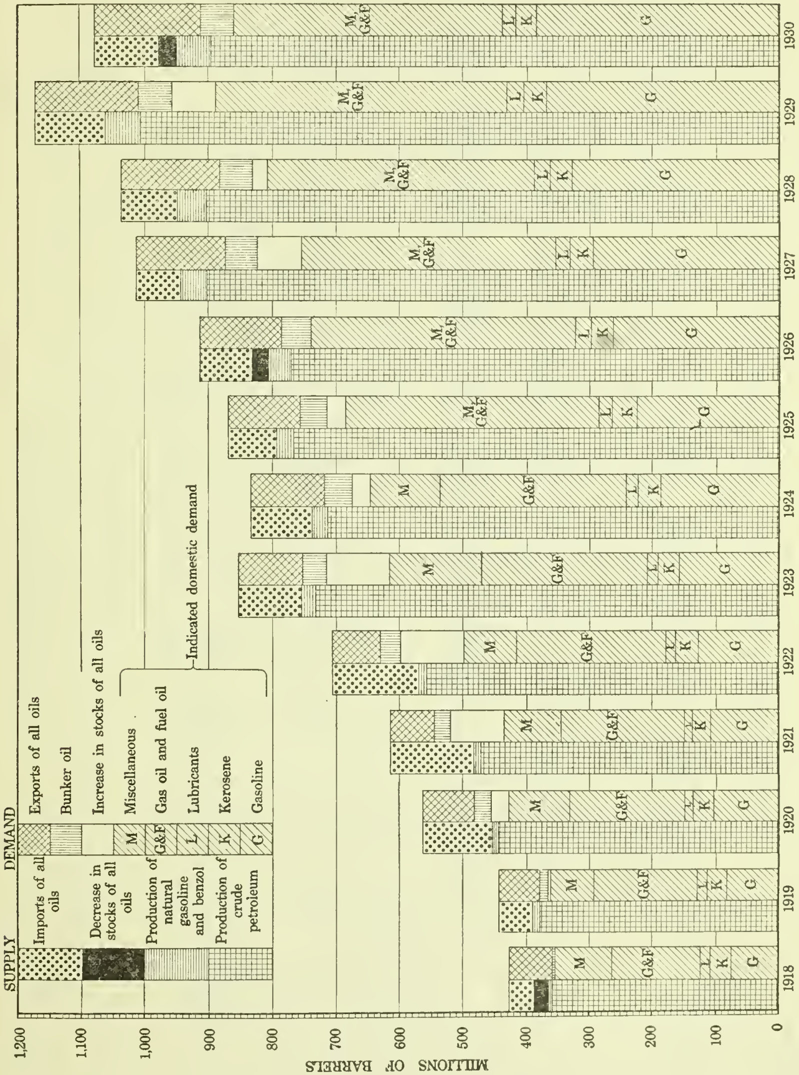

FIGURE 54.—Supply and demand of all oils, 1918-1930

Summary of statistics relating to supply and demand of all oils, 1918–1930

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Domestic production:													
Crude petroleum....thousands of barrels [1]	355, 928	378, 367	442, 929	472, 183	557, 531	732, 407	713, 940	763, 743	770, 874	901, 129	901, 474	1, 007, 323	898, 011
Natural gasoline....do	6, 727	8, 370	9, 161	10, 713	12, 044	19, 434	22, 235	26, 307	32, 305	38, 657	42, 326	52, 271	52, 631
Benzol....do	1, 273	1, 497	1, 771	1, 348	1, 688	2, 327	2, 203	1, 857	2, 112	2, 562	2, 809	3, 055	2, 689
Total	363, 928	388, 234	453, 861	484, 244	571, 263	754, 168	738, 378	791, 907	805, 291	942, 348	946, 609	1, 062, 649	953, 331
Imports:													
Crude petroleum....do	37, 736	52, 822	106, 175	125, 364	127, 308	82, 015	77, 775	61, 824	60, 382	58, 383	79, 767	78, 933	62, 129
Refined products....do	1, 227	1, 376	2, 647	3, 428	8, 665	17, 638	16, 806	16, 376	20, 938	13, 353	11, 790	29, 777	43, 489
Total new supply, all oils....do	402, 891	442, 432	562, 683	613, 036	707, 236	853, 821	832, 959	870, 107	886, 611	1, 014, 084	1, 038, 166	1, 171, 359	1, 058, 949
Increase in stocks, all oils....do	[2] 24, 518	4, 053	27, 303	84, 583	102, 024	99, 461	27, 897	29, 291	[2] 26, 419	70, 092	22, 775	68, 156	[2] 24, 000
Exports: [3]													
Crude petroleum....do	5, 884	6, 348	9, 295	9, 627	10, 805	17, 534	18, 239	13, 337	15, 407	15, 844	18, 966	26, 401	23, 705
Refined products....do	62, 128	57, 500	70, 281	62, 025	63, 539	84, 447	98, 905	100, 497	116, 543	125, 805	135, 991	136, 719	132, 794
Domestic demand, all oils....do	359, 397	374, 531	455, 804	456, 801	530, 868	652, 379	687, 918	726, 982	781, 080	802, 343	860, 434	940, 083	926, 450
Crude runs to stills....do	326, 025	361, 520	433, 915	443, 363	500, 706	581, 238	643, 719	739, 920	779, 264	828, 835	913, 295	987, 708	927, 447
World production of crude petroleum....do	503, 515	555, 875	688, 884	766, 002	858, 898	1, 015, 736	1, 014, 318	1, 068, 933	1, 096, 823	1, 262, 582	1, 324, 774	1, 485, 867	1, 410, 037
United States percentage of world production of crude petroleum	71	68	64	62	65	72	70	71	70	71	68	68	64
Total value of domestic production of crude petroleum at wells......thousands of dollars	703, 944	760, 266	1, 360, 745	814, 745	895, 111	978, 430	1, 022, 683	1, 284, 960	1, 447, 760	1, 172, 830	1, 054, 880	1, 280, 417	1, 070, 200
Average price per barrel of crude petroleum at wells	$1. 98	$2. 01	$3. 07	$1. 73	$1. 61	$1. 34	$1. 43	$1. 68	$1. 88	$1. 30	$1. 17	$1. 27	$1. 19
Total number of producing oil wells in the United States Dec. 31	(4)	(4)	[5] 258, 600	274, 500	284, 880	290, 100	299, 100	306, 100	318, 600	323, 300	327, 800	328, 200	331, 070
Total number of oil wells completed in the United States during year	17, 845	21, 052	24, 273	14, 666	17, 333	16, 206	14, 587	16, 559	19, 013	14, 442	12, 526	15, 572	11, 640

[1] 42 United States gallons.
[2] Decrease.
[3] Includes shipments to noncontiguous Territories.
[4] Figures not available.
[5] Oct. 31.

Summary of supply and demand of all oils (including wax, coke, and asphalt), 1929 and 1930, by months

[Thousands of barrels of 42 U. S. gallons]

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The year
1929													
New supply:													
Domestic production—													
Crude petroleum	82,054	75,456	82,463	80,412	84,499	83,407	91,309	92,165	87,453	88,430	78,758	80,917	1,007,323
Daily average	2,647	2,695	2,660	2,680	2,726	2,780	2,945	2,973	2,915	2,853	2,625	2,610	2,760
Natural gasoline	3,983	3,736	4,324	4,264	4,343	4,250	4,417	4,507	4,574	4,912	4,504	4,457	52,271
Benzol	250	233	264	255	267	257	264	264	253	265	245	238	3,055
Total production	86,287	79,425	87,051	84,931	89,109	87,914	95,990	96,936	92,280	93,607	83,507	85,612	1,062,649
Daily average	2,783	2,837	2,808	2,831	2,874	2,930	3,096	3,127	3,076	3,020	2,784	2,762	2,911
Imports [1]—													
Crude petroleum	8,075	7,016	6,790	7,828	7,552	6,591	6,122	5,800	6,953	5,766	4,554	5,886	78,933
Refined products	884	908	1,489	2,634	2,732	2,426	3,176	3,430	2,725	3,643	3,327	2,403	29,777
Total new supply, all oils	95,246	87,349	95,330	95,393	99,393	96,931	105,288	106,166	101,958	103,016	91,388	93,901	1,171,359
Daily average	3,072	3,120	3,075	3,180	3,206	3,231	3,396	3,425	3,399	3,323	3,046	3,029	3,209
Increase in stocks, all oils	10,682	10,223	11,085	5,963	3,605	6,248	4,985	4,872	5,498	4,579	[2] 3,042	3,458	68,156
Demand:													
Total demand	84,564	77,126	84,245	89,430	95,788	90,683	100,303	101,294	96,460	98,437	94,430	90,443	1,103,203
Daily average	2,728	2,755	2,718	2,981	3,090	3,023	3,236	3,268	3,215	3,175	3,148	2,918	3,022
Exports [1]—													
Crude petroleum	1,972	1,678	1,600	1,726	1,932	2,615	3,117	2,236	1,988	2,869	2,579	2,089	26,401
Refined products	11,760	9,507	10,873	10,364	11,080	12,483	12,441	12,771	8,570	13,984	10,565	12,321	136,719
Domestic demand	70,832	65,941	71,772	77,340	82,776	75,585	84,745	86,287	85,902	81,584	81,286	76,033	940,083
Daily average	2,285	2,355	2,315	2,578	2,670	2,520	2,734	2,783	2,863	2,632	2,710	2,453	2,576
Excess of daily average domestic production over domestic demand	498	482	493	253	204	410	362	344	213	388	74	309	335
Stocks (end of month):													
Crude petroleum [3]	497,525	505,920	512,989	516,161	518,980	523,104	529,983	538,982	543,557	545,186	539,837	540,851	540,851 [4] 535,514
Natural gasoline at plants	741	821	995	1,166	1,390	1,356	1,156	893	661	490	514	604	604 [4] 2,291
Refined products	133,426	135,174	139,016	141,636	142,198	144,356	142,662	138,798	139,953	143,074	145,357	147,711	147,711 [4] 151,692
Grand total stocks, all oils	631,692	641,915	653,000	658,963	662,568	668,816	673,801	678,673	684,171	688,750	685,708	689,166	689,166 [4] 689,497
Days' supply [5]	232	233	240	221	214	221	208	208	213	217	218	236	228
Bunker oil (included above in domestic demand)	3,915	4,252	4,183	4,179	4,704	4,544	4,593	4,734	4,424	4,540	4,110	4,100	52,278

[1] From Bureau of Foreign and Domestic Commerce. Exports include benzol and shipments to Alaska, Hawaii, and Porto Rico.

[2] Decrease.

[3] Includes fuel oil in California.

[4] For comparison with 1930.

[5] Grand total stocks of all oils, divided by daily average total demand.

Summary of supply and demand of all oils (including wax, coke, and asphalt), 1929 and 1930, by months—Continued

[Thousands of barrels of 42 U. S. gallons]

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The year
1930													
New supply:													
Domestic production—													
Crude petroleum	79,633	74,290	78,226	77,483	80,528	77,060	76,922	74,831	71,216	72,893	67,957	66,972	898,011
Daily average	2,569	2,653	2,523	2,583	2,598	2,569	2,481	2,414	2,374	2,351	2,265	2,160	2,460
Natural gasoline	4,483	4,319	4,650	4,505	4,595	4,341	4,307	4,286	4,152	4,405	4,317	4,271	52,631
Benzol	240	229	262	253	254	235	224	216	202	204	187	183	2,689
Total production	84,356	78,838	83,138	82,241	85,377	81,636	81,453	79,333	75,570	77,502	72,461	71,426	953,331
Daily average	2,721	2,816	2,682	2,741	2,754	2,721	2,628	2,559	2,519	2,500	2,415	2,304	2,612
Imports [1]—													
Crude petroleum	5,450	4,321	4,827	5,781	4,984	5,767	5,877	5,059	5,808	5,061	4,467	4,727	62,129
Refined products	3,806	3,224	3,714	3,214	3,603	4,028	4,040	4,329	3,614	3,800	2,807	3,310	43,489
Total new supply, all oils	93,612	86,383	91,679	91,236	93,964	91,431	91,370	88,721	84,992	86,363	79,735	79,463	1,058,949
Daily average	3,020	3,085	2,957	3,041	3,031	3,048	2,947	2,862	2,833	2,786	2,658	2,563	2,901
Increase in stocks, all oils	4,112	5,642	1,396	[2] 1,840	2,001	[2] 2,606	[2] 4,494	[2] 6,877	[2] 8,439	[2] 4,014	[2] 2,504	[2] 6,377	[2] 24,000
Demand:													
Total demand	89,500	80,741	90,283	93,076	91,963	94,037	95,864	95,598	93,431	90,377	82,239	85,840	1,082,949
Daily average	2,887	2,884	2,912	3,103	2,967	3,135	3,092	3,084	3,114	2,915	2,741	2,769	2,967
Exports [1]—													
Crude petroleum	1,808	1,731	1,944	1,900	2,202	2,508	1,973	2,407	1,961	2,167	1,765	1,339	23,705
Refined products	12,042	10,123	12,688	12,482	9,468	14,332	11,040	12,563	8,753	11,807	7,768	9,728	132,794
Domestic demand	75,650	68,887	75,651	78,694	80,293	77,197	82,851	80,628	82,717	76,403	72,706	74,773	926,450
Daily average	2,440	2,460	2,440	2,623	2,590	2,573	2,673	2,601	2,757	2,465	2,424	2,412	2,538
Excess of daily average domestic production over domestic demand	281	356	242	118	164	148	[6] 45	[6] 42	[6] 238	35	[6] 9	[6] 108	74
Stocks (end of month):													
Crude petroleum [3]	534,938	539,210	538,229	535,850	533,733	531,135	530,725	526,785	520,900	518,736	517,021	512,230	512,230
Natural gasoline [7]	2,523	2,733	2,912	2,946	3,337	3,312	3,337	3,005	2,534	2,356	2,380	2,377	2,377
Refined products	156,148	157,308	159,506	160,011	163,738	163,755	159,646	157,041	154,958	153,286	152,473	150,890	150,890
Grand total stocks, all oils	693,609	699,251	700,647	698,807	700,808	698,202	693,708	686,831	678,392	674,378	671,874	665,497	665,497
Days' supply [5]	240	242	241	225	236	223	224	223	218	231	245	240	224
Bunker oil (included above in domestic demand)	4,223	4,065	4,077	4,234	4,657	4,041	4,316	4,702	4,333	4,463	3,794	3,868	50,773

[1] From Bureau of Foreign and Domestic Commerce. Exports include benzol and shipments to Alaska, Hawaii, and Porto Rico.

[2] Decrease.

[3] Includes fuel oil in California.

[5] Grand total stocks of all oils, divided by daily average total demand.

[6] Deficiency.

[7] Includes natural gasoline held at refineries, for earlier years included with refined products.

PRODUCTION

DOMESTIC PRODUCTION

BY MONTHS

Daily average production in 1930 was at its highest in February, declined materially in March, but showed comparatively little change in April, May, and June. From July to the end of the year production declined steadily; and the daily average for December—2,160,000 barrels—was the lowest for any month since July, 1926. The supply of crude came much closer to meeting demand both as to quantity and time than in 1929. For example, the decline of 11 per cent in total output in 1930 resulted in withdrawals from instead of additions to storage, as in 1929; furthermore, the major portion of the output in 1930 was produced in the first half of the year, or just before the period of highest demand, whereas more than half the production in 1929 was produced in the last six months, when consumption was waning.

Petroleum produced in the United States, 1926–1930, by months

[Thousands of barrels of 42 U. S. gallons]

Year	January	February	March	April	May	June	July	August	September	October	November	December	The year
1926	59,981	54,892	60,880	60,371	62,822	61,789	65,168	67,009	65,782	69,664	69,891	72,625	770,874
1927	71,758	68,122	75,514	73,132	76,845	75,303	78,780	78,788	75,909	77,534	74,493	74,951	901,129
1928	72,793	68,565	74,528	72,393	75,277	72,676	75,584	77,807	76,484	79,751	76,123	79,493	901,474
1929	82,054	75,456	82,463	80,412	84,499	83,407	91,309	92,165	87,453	88,430	78,758	80,917	1,007,323
1930	79,633	74,290	78,226	77,483	80,528	77,060	76,922	74,831	71,216	72,893	67,957	66,972	898,011

BY FIELDS OR DISTRICTS

Of the eight major producing districts only two, the Appalachian and the Gulf coast, showed increases in output in 1930. The gain in the Appalachian district marked its sixth successive increase; that in the Gulf coast was its second. The Mid-Continent district continued to be the major producing area in the United States in 1930, and the ratio of its production to the total increased from 58 per cent in 1929 to 59 per cent in 1930. Statistics for the production of grades A and B in the coastal fields, compiled in 1930 for the first time, indicate that approximately three-sevenths of the output is grade A, or heavy oil, refined chiefly for lubricants, and four-sevenths is grade B, a lighter oil with a higher percentage of gasoline.

Pennsylvania-grade crude oil.—In 1930, for the first time, the bureau compiled statistics of Pennsylvania-grade crude, a name generally applied to all but a small fraction of the output of New York, Pennsylvania, eastern and southeastern Ohio, and West Virginia. According to these data the total output of this grade of oil in 1930 amounted to 24,243,000 barrels, an increase of 3.5 per cent over the 1929 total of the Pennsylvania Grade Crude Oil Association.

Petroleum produced in the United States, 1930, by fields

[Thousands of barrels of 42 U. S. gallons]

Field	January	February	March	April	May	June	July	August
Appalachian;								
Pennsylvania grade	2, 180	2, 127	2, 273	2, 398	2, 438	2, 130	1, 899	1, 627
Other (including Kentucky)	871	798	824	852	869	816	895	818
Lima, northeastern Indiana, and Michigan	521	506	495	485	464	467	482	412
Illinois and southwestern Indiana	561	558	609	598	627	598	620	611
Mid-Continent;								
Northern Louisiana-Arkansas	2, 826	2, 806	3, 048	3, 002	2, 785	2, 908	2, 937	2, 857
West Texas and southeastern New Mexico	10, 663	9, 834	10, 651	9, 812	10, 055	9, 683	10, 384	10, 003
Other (Oklahoma, Kansas, northern Texas, etc.)	32, 508	29, 454	32, 488	33, 698	36, 194	34, 667	32, 878	31, 723
Gulf coast:[1]								
Grade A	2, 365	2, 613	2, 740	2, 621	2, 590	2, 528	2, 631	2, 519
Grade B	3, 313	2, 945	3, 424	3, 295	3, 490	3, 411	3, 506	3, 523
Rocky Mountain[2]	1, 927	1, 844	2, 050	2, 026	2, 046	1, 901	1, 941	2, 021
California[3]	21, 898	20, 805	19, 624	18, 696	18, 970	17, 951	18, 749	18, 717
	79, 633	74, 290	78, 226	77, 483	80, 528	77, 060	76, 922	74, 831
Daily average	2, 569	2, 653	2, 523	2, 583	2, 598	2, 569	2, 481	2, 414

Field	September	October	November	December	The year		
					Quantity	Value at wells	
						Total (thousands of dollars)	Average per barrel
Appalachian:							
Pennsylvania grade	1, 755	1, 932	1, 727	1, 757	24, 243	61, 234	$2. 53
Other (including Kentucky)	830	828	711	750	9, 862	14, 972	1. 52
Lima, northeastern Indiana, and Michigan	367	369	342	366	5, 276	7, 170	1. 36
Illinois and southwestern Indiana	478	498	445	474	6, 677	10, 640	1. 59
Mid-Continent:							
Northern Louisiana-Arkansas	2, 747	2, 865	2, 729	2, 854	34, 364	34, 300	1. 00
West Texas and southeastern New Mexico	9, 317	9, 923	9, 179	8, 794	118, 298	95, 320	. 81
Other (Oklahoma, Kansas, northern Texas, etc.)	30, 113	30, 661	27, 511	26, 890	378, 785	471, 850	1. 25
Gulf coast:[1]							
Grade A	2, 474	2, 402	2, 221	2, 206	29, 910	32, 000	1. 07
Grade B	3, 227	3, 221	3, 142	3, 269	39, 766	40, 850	1. 03
Rocky Mountain[2]	1, 975	2, 002	1, 892	1, 876	23, 501	30, 165	1. 28
California[3]	17, 933	18, 192	18, 058	17, 736	227, 329	271, 699	1. 20
	71, 216	72, 893	67, 957	66, 972	898, 011	1, 070, 200	1. 19
Daily average	2, 374	2, 351	2, 265	2, 160	2, 460	----------	----------

[1] Salt-dome pools.
[2] Includes Alaska.
[3] Annual and semiannual figures from Division of Mines, Department of Natural Resources, California. Monthly figures prorated on basis of monthly reports by the American Petroleum Institute.

Pennsylvania-grade crude oil produced, 1924–1930, by States [1]

[Thousands of barrels of 42 U. S. gallons]

State	1924	1925	1926	1927	1928	1929	1930
New York	1, 440	1, 695	1, 956	2, 242	2, 603	3, 377	3, 647
Pennsylvania	7, 486	8, 097	8, 961	9, 526	9, 956	11, 820	12, 786
West Virginia	5, 920	5, 763	5, 946	6, 023	5, 661	5, 574	5, 068
Central and eastern Ohio	2, 168	2, 242	2, 011	2, 346	2, 877	2, 654	2, 742
	17, 014	17, 797	18, 874	20, 137	21, 097	23, 425	24, 243

[1] Pennsylvania Grade Crude Oil Association, 1924–1929.

BY STATES

The rank of the three leading producing States—Texas, California, and Oklahoma—remained unchanged in 1930. Texas, with a small decline in production from 1929, retained first place; California, with a material decline in output, retained second place but was not far ahead of Oklahoma in third place. Kansas was fourth in size of output and far ahead of the State ranking next. New Mexico rose from seventeenth to ninth; Arkansas, which had ranked fifth, was displaced by Louisiana; and Montana and New York, which had ranked fourteenth and fifteenth, respectively, in 1929, were similarly reversed. The first three States produced 82 per cent of the total in 1930, compared with 84 per cent in 1929. (See fig. 55.)

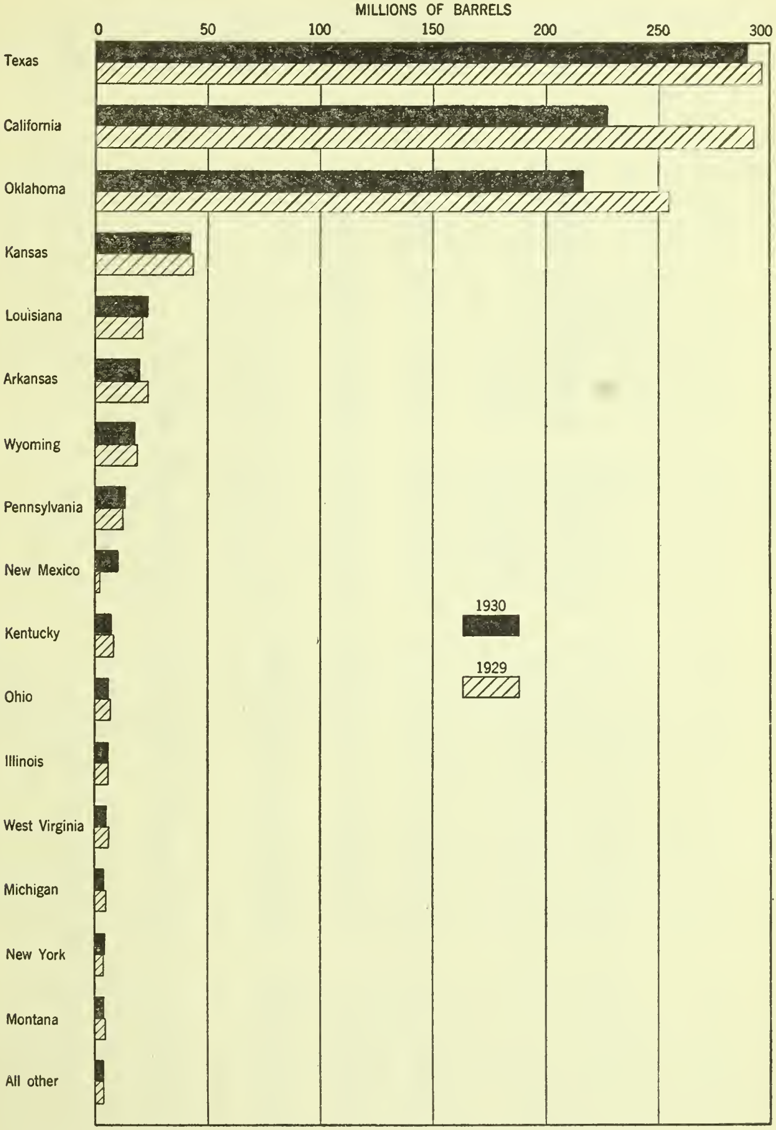

FIGURE 55.—Production of crude petroleum, 1929 and 1930, by States

Petroleum produced in the United

[Thousands of barrels

Year	New York	Pennsylvania	Ohio	West Virginia	California	Kentucky	Tennessee	Colorado	Indiana	Illinois	Kansas
1859–1875	(2)	[2] 74,072	------	------	------	------	------	------	------	------	------
1876	(2)	[2] 8,969	32	120	12	------	------	------	------	------	------
1877	(2)	[2] 13,135	30	172	13	------	------	------	------	------	------
1878	(2)	[2] 15,164	38	180	15	------	------	------	------	------	------
1879	(2)	[2] 19,685	29	180	20	------	------	------	------	------	------
1880	(2)	[2] 26,028	39	179	40	------	------	------	------	------	------
1881	(2)	[2] 27,376	34	151	100	------	------	------	------	------	------
1882	6,685	23,368	40	128	129	------	------	------	------	------	------
1883	4,004	19,125	47	126	143	[3] 5	(3)	------	------	------	------
1884	3,231	20,541	90	90	262	[3] 4	(3)	------	------	------	------
1885	2,658	18,118	662	91	325	[3] 5	(3)	------	------	------	------
1886	2,151	23,647	1,783	102	377	[3] 5	(3)	------	------	------	------
1887	2,075	20,281	5,023	145	678	[3] 5	(3)	76	------	------	------
1888	(2)	[2] 16,489	10,011	119	690	[3] 5	(3)	298	------	------	------
1889	1,897	19,591	12,472	544	303	[3] 5	(3)	317	33	1	1
1890	(2)	[2] 28,458	16,125	493	307	[3] 6	(3)	369	64	1	1
1891	1,585	31,424	17,740	2,406	324	[3] 9	(3)	666	137	1	1
1892	1,273	27,149	16,363	3,810	385	[3] 7	(3)	824	698	1	5
1893	1,032	19,283	16,249	8,446	470	[3] 3	(3)	594	2,335	1	18
1894	942	18,078	16,792	8,577	706	[3] 2	(3)	516	3,689	(4)	40
1895	913	18,231	19,545	8,120	1,209	[3] 2	(3)	438	4,386	(4)	44
1896	1,205	19,379	23,941	10,020	1,253	[3] 2	(3)	361	4,681	(4)	114
1897	1,279	17,983	21,561	13,090	1,903	(3 4)	(3)	385	4,122	1	81
1898	1,205	14,743	18,739	13,615	2,257	[3] 6	(3)	444	3,731	(4)	72
1899	1,321	13,054	21,142	13,911	2,642	[3] 18	(3)	390	3,848	(4)	70
1900	1,301	13,258	22,363	16,196	4,325	[3] 62	(3)	317	4,874	(4)	75
1901	1,207	12,625	21,648	14,177	8,787	[3] 137	(3)	461	5,757	(4)	179
1902	1,120	12,064	21,014	13,513	13,984	[3] 185	(3)	397	7,481	(4)	332
1903	1,163	11,355	20,480	12,900	24,382	[3] 554	(3)	484	9,186	------	932
1904	1,113	11,126	18,877	12,645	29,649	[3] 998	(3)	501	11,339	------	4,251
1905	1,118	10,437	16,347	11,578	33,428	[3] 1,217	(3)	376	10,964	181	[6] 12,014
1906	1,243	10,257	14,783	10,121	33,099	[3] 1,214	(3)	328	7,674	4,397	[6] 21,718
1907	1,212	10,000	12,207	9,095	39,748	[3] 821	(3)	332	5,128	24,282	2,410
1908	1,160	9,424	10,859	9,523	44,855	728	------	380	3,283	33,686	1,801
1909	1,135	9,299	10,633	10,745	55,472	639	------	311	2,296	30,898	1,264
1910	1,054	8,795	9,916	11,753	73,011	469	------	240	2,160	33,143	1,128
1911	953	8,248	8,817	9,796	81,134	472	------	227	1,695	31,317	1,279
1912	874	7,838	8,969	12,129	87,269	484	------	206	970	28,602	1,593
1913	948	7,917	8,781	11,567	97,788	525	------	189	956	23,894	2,375
1914	939	8,170	8,536	9.680	99,775	503	------	223	1,336	21,920	3,104
1915	888	7,838	7,825	9,265	86,592	437	------	208	876	19,042	2,823
1916	874	7,593	7,744	8,731	90,952	1,202	1	197	769	17,714	8,738
1917	880	7,733	7,751	8,379	93,878	3,088	12	121	760	15,777	36,536
1918	809	7,408	7,285	7,867	97,532	4,368	8	143	878	13,366	45,451
1919	851	8,137	7,736	8,327	101,183	9,278	15	121	972	11,960	33,048
1920	906	7,438	7,400	8,249	103,377	8,738	14	111	945	10,774	39,005
1921	988	7,418	7,335	7,822	112,600	9,013	12	108	1,158	10,043	36,456
1922	1,000	7,425	6,781	7,021	138,468	8,973	10	97	1,087	9,383	31,766
1923	1,250	7,609	7,085	6,358	262,876	8,069	8	86	1,043	8,707	28,250
1924	1,440	7,486	6,811	5,920	228,933	7,407	10	445	935	8,081	28,836
1925	1,695	8,097	7,212	5,763	232,492	6,759	24	1,226	829	7,863	38,357
1926	1,956	8,961	7,272	5,946	224,673	6,274	43	2,768	808	7,760	41,498
1927	2,242	9,526	7,593	6,023	231,196	6,719	60	2,831	852	6,994	41,069
1928	2,603	9,956	7,015	5,661	231,811	7,359	46	2,774	1,052	6,462	38,596
1929	3,377	11,820	6,743	5,574	292,534	7,775	19	2,358	981	6,319	42,813
1930	3,647	12,803	6,486	5,071	227,329	7,389	21	1,656	994	5,736	41,638
	[7] 75,402	[7] 841,432	548,836	372,210	3,497,695	[3] 111,945	[3] 303	25,900	117,762	398,307	[6] 589,782
Percentage of total production	0.6	6.4	4.2	2.8	26.6	0.9	------	0.2	0.9	3.0	4.5

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[1] 1889–1899, Missouri; 1900–1906, Michigan and Missouri; 1907–1911, Michigan, Missouri, and Utah; 1912, 1917, 1918, Alaska and Michigan; 1913 and 1919, Alaska, Michigan, Missouri, and New Mexico; 1914–1916, Alaska, Michigan, and Missouri; 1920, Alaska, Arkansas, Missouri, New Mexico, and Utah; 1921–1923, Alaska, Missouri, and New Mexico; 1924–1930, Alaska and Utah.

[2] New York included with Pennsylvania.

[3] Tennessee included with Kentucky, 1883 to 1907, inclusive.

States, 1859–1930, by States

of 42 U. S. gallons]

Texas	Oklahoma	Wyoming	Michigan	Louisiana	New Mexico	Montana	Arkansas	Other [1]	Total			Year
									Quantity	Value at wells		
										Total (thousands of dollars)	Average per barrel	
-------	-------	-------	-------	-------	-------	-------	-------	-------	74,072	215,781	$2.91	1859–1875
-------	-------	-------	-------	-------	-------	-------	-------	-------	9,133	22,983	2.52	1876
-------	-------	-------	-------	-------	-------	-------	-------	-------	13,350	31,789	2.38	1877
-------	-------	-------	-------	-------	-------	-------	-------	-------	15,397	18,045	1.17	1878
-------	-------	-------	-------	-------	-------	-------	-------	-------	19,914	17,211	.86	1879
-------	-------	-------	-------	-------	-------	-------	-------	-------	26,286	24,601	.94	1880
-------	-------	-------	-------	-------	-------	-------	-------	-------	27,661	25,448	.92	1881
-------	-------	-------	-------	-------	-------	-------	-------	-------	30,350	23,631	.78	1882
-------	-------	-------	-------	-------	-------	-------	-------	-------	23,450	25,790	1.10	1883
-------	-------	-------	-------	-------	-------	-------	-------	-------	24,218	20,596	.85	1884
-------	-------	-------	-------	-------	-------	-------	-------	-------	21,859	19,198	.88	1885
-------	-------	-------	-------	-------	-------	-------	-------	-------	28,065	19,996	.71	1886
-------	-------	-------	-------	-------	-------	-------	-------	-------	28,283	18,877	.67	1887
-------	-------	-------	-------	-------	-------	-------	-------	-------	27,612	17,948	.65	1888
(4)	-------	-------	-------	-------	-------	-------	-------	(4)	35,164	26,963	.77	1889
(4)	-------	-------	-------	-------	-------	-------	-------	(4)	45,824	35,365	.77	1890
(4)	(4)	-------	-------	-------	-------	-------	-------	(4)	54,293	30,527	.56	1891
(4)	(4)	-------	-------	-------	-------	-------	-------	(4)	50,515	25,907	.51	1892
(4)	(4)	-------	-------	-------	-------	-------	-------	(4)	48,431	28,950	.60	1893
(4)	(4)	2	-------	-------	-------	-------	-------	(4)	49,344	35,522	.72	1894
(4)	(4)	4	-------	-------	-------	-------	-------	(4)	52,892	57,632	1.09	1895
1	(4)	3	-------	-------	-------	-------	-------	(4)	60,960	58,519	.96	1896
66	1	4	-------	-------	-------	-------	-------	(4)	60,476	40,874	.68	1897
546	-------	6	-------	-------	-------	-------	-------	(4)	55,364	44,193	.80	1898
669	-------	6	-------	-------	-------	-------	-------	(4)	57,071	64,604	1.13	1899
836	6	6	(5)	-------	-------	-------	-------	2	63,621	75,989	1.19	1900
4,394	10	5	(5)	-------	-------	-------	-------	2	69,389	66,417	.96	1901
18,084	37	6	(5)	549	-------	-------	-------	1	88,767	71,179	.80	1902
17,956	139	9	(5)	918	-------	-------	-------	3	100,461	94,694	.94	1903
22,241	1,367	12	(5)	2,959	-------	-------	-------	3	117,081	101,175	.86	1904
28,136	(6)	8	(5)	8,910	-------	-------	-------	3	134,717	84,157	.62	1905
12,568	(6)	7	(5)	9,077	-------	-------	-------	3	126,494	92,445	.73	1906
12,323	43,524	9	(5)	5,000	-------	-------	-------	4	166,095	120,107	.72	1907
11,207	45,799	18	(5)	5,789	-------	-------	-------	15	178,527	129,079	.72	1908
9,534	47,859	20	(5)	3,060	-------	-------	-------	6	183,171	128,329	.70	1909
8,899	52,029	115	(5)	6,841	-------	-------	-------	4	209,557	127,900	.61	1910
9,526	56,069	187	(5)	10,721	-------	-------	-------	8	220,449	134,045	.61	1911
11,735	51,427	1,572	(5)	9,263	-------	-------	-------	4	222,935	164,213	.74	1912
15,010	63,579	2,407	(5)	12,499	(5)	-------	-------	11	248,446	237,121	.95	1913
20,068	73,632	3,560	(5)	14,309	-------	-------	-------	8	265,763	214,125	.81	1914
24,943	97,915	4,246	(5)	18,192	-------	-------	-------	14	281,104	179,463	.64	1915
27,645	107,072	6,234	(5)	15,248	-------	45	-------	8	300,767	330,900	1.10	1916
32,413	107,508	8,978	(5)	11,392	-------	100	-------	10	335,316	522,635	1.56	1917
38,750	103,347	12,596	(5)	16,043	-------	69	-------	8	355,928	703,944	1.98	1918
79,366	86,911	13,172	(5)	17,188	(5)	90	-------	12	378,367	760,266	2.01	1919
96,868	106,206	16,831	-------	35,714	(5)	340	(5)	13	442,929	1,360,745	3.07	1920
106,166	114,634	19,333	-------	27,103	(5)	1,509	10,473	12	472,183	814,745	1.73	1921
118,684	149,571	26,715	-------	35,376	(5)	2,449	12,712	13	557,531	895,111	1.61	1922
131,023	160,929	44,785	-------	24,919	(5)	2,782	36,610	18	732,407	978,430	1.34	1923
134,522	173,538	39,498	-------	21,124	98	2,815	46,028	13	713,940	1,022,683	1.43	1924
144,648	176,768	29,173	4	20,272	1,060	4,091	77,398	12	763,743	1,284,960	1.68	1925
166,916	179,195	25,776	94	23,201	1,666	7,727	58,332	8	770,874	1,447,760	1.88	1926
217,389	277,775	21,307	439	22,818	1,226	5,058	40,005	7	901,129	1,172,830	1.30	1927
257,320	249,857	21,461	594	21,847	943	4,015	32,096	6	901,474	1,054,880	1.17	1928
296,876	255,004	19,314	4,528	20,554	1,830	3,980	24,917	7	1,007,323	1,280,417	1.27	1929
290,457	216,486	17,868	3,911	23,272	10,189	3,349	19,702	7	898,011	1,070,200	1.19	1930
2,367,785	[6]2,998,194	335,253	[8]9,570	444,158	[9]17,012	38,419	358,273	245	13,148,483	17,671,894	1.34	
18.0	22.8	2.5	0.1	3.4	0.1	0.3	2.7	-------	100.0	-------	-------	

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[4] Less than 500 barrels. (See Mineral Resources, 1916, pt. 2, pp. 684–685.)

[5] Included under "Other."

[6] Oklahoma included with Kansas in 1905 and 1906.

[7] Early production in New York included with Pennsylvania.

[8] Figures represent 1925–1930 production only. Earlier years included under "Other."

[9] Figures represent 1924–1930 production only. Earlier years included under "Other."

Petroleum produced in the United States, 1930, by States

[Thousands of barrels of 42 U. S. gallons]

	January	February	March	April	May	June	July	August	September	October	November	December	The year	Value at wells (thousands of dollars)
Arkansas	1,683	1,665	1,793	1,725	1,622	1,685	1,699	1,641	1,574	1,596	1,476	1,543	19,702	17,390
California[1]	21,898	20,805	19,624	18,696	18,970	17,951	18,749	18,717	17,933	18,192	18,058	17,736	227,329	271,699
Colorado	142	148	143	138	141	134	143	136	129	135	129	138	1,656	1,480
Illinois	487	478	532	511	540	513	531	523	409	428	378	406	5,736	9,100
Indiana:														
Southwestern	74	80	77	87	87	85	89	88	69	70	67	68	941	1,540
Northeastern	4	4	4	5	6	5	5	4	5	5	3	3	53	70
Total Indiana	78	84	81	92	93	90	94	92	74	75	70	71	994	1,610
Kansas	3,149	3,103	3,477	3,520	3,948	4,087	3,618	3,414	3,439	3,432	3,252	3,199	41,638	54,880
Kentucky	665	604	625	643	663	609	676	610	621	608	524	541	7,389	11,080
Louisiana:														
Gulf coast[2]	551	596	620	601	664	688	784	831	790	837	829	819	8,610	9,200
Northern	1,143	1,141	1,255	1,277	1,163	1,223	1,238	1,216	1,173	1,269	1,253	1,311	14,662	16,910
Total Louisiana	1,694	1,737	1,875	1,878	1,827	1,911	2,022	2,047	1,963	2,106	2,082	2,130	23,272	26,110
Michigan	416	390	382	360	335	342	356	301	253	256	253	267	3,911	5,160
Montana	261	263	270	298	308	288	301	312	267	252	251	278	3,349	5,420
New Mexico	316	313	345	366	576	750	1,347	1,276	1,258	1,267	1,157	1,218	10,189	9,180
New York	314	327	369	373	392	326	275	213	263	285	248	262	3,647	9,850
Ohio:														
Central and eastern	446	423	436	464	463	450	457	402	417	441	367	408	5,174	10,020
Northwestern	101	112	109	120	123	120	121	107	109	108	86	96	1,312	1,940
Total Ohio	547	535	545	584	586	570	578	509	526	549	453	504	6,486	11,960
Oklahoma	20,276	17,643	19,361	19,919	21,204	19,570	17,967	17,010	16,553	16,882	15,095	15,006	216,486	279,250
Pennsylvania	1,162	1,127	1,217	1,298	1,312	1,109	939	862	911	1,008	946	912	12,803	33,410
Tennessee	2	1	1	1	2	1	3	3	1	1	3	2	21	26
Texas:														
Gulf coast[2]	5,127	4,962	5,544	5,315	5,416	5,251	5,353	5,211	4,911	4,786	4,534	4,656	61,066	63,650
West Texas	10,401	9,568	10,343	9,502	9,522	8,987	9,096	8,782	8,120	8,713	8,079	7,617	108,730	87,040
Rest of State	9,083	8,708	9,650	10,259	11,042	11,010	11,293	11,299	10,121	10,347	9,164	8,685	120,661	137,720

Total Texas	24,611	23,238	25,537	25,076	25,980	25,248	25,742	25,292	23,152	23,846	21,777	20,958	290,457	288,410
West Virginia	462	443	449	471	475	451	444	355	372	417	350	382	5,071	11,820
Wyoming	1,470	1,386	1,599	1,533	1,553	1,424	1,437	1,517	1,517	1,558	1,455	1,419	17,868	22,350
Other [3]			1	1	1	1	1	1	1				7	15
United States	79,633	74,290	78,226	77,483	80,528	77,060	76,922	74,831	71,216	72,893	67,957	66,972	898,011	1,070,200
Daily average	2,569	2,653	2,523	2,583	2,598	2,569	2,481	2,414	2,374	2,351	2,265	2,160	2,460	
Classified by gravity (approximately):														
Light	70,544	65,344	69,169	68,688	71,959	68,603	68,191	66,230	62,958	64,748	60,275	59,415	796,124	1,070,200
Heavy	9,089	8,946	9,057	8,795	8,569	8,457	8,731	8,601	8,258	8,145	7,682	7,557	101,887	
United States	79,633	74,290	78,226	77,483	80,528	77,060	76,922	74,831	71,216	72,893	67,957	66,972	898,011	1,070,200

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[1] Annual and semiannual figures from Division of Mines, Department of Natural Resources, California. Monthly figures prorated on basis of monthly reports by the American Petroleum Institute.

[2] Salt-dome pools.

[3] Alaska and Utah.

Daily average production of crude petroleum in the United States, 1930, by months and principal States

[Barrels of 42 U. S. gallons]

State	January	February	March	April	May	June	July	August	September	October	November	December	The year
Arkansas	54,300	59,500	57,800	57,500	52,300	56,200	54,800	52,900	52,500	51,500	49,200	49,800	54,000
California	706,400	743,000	633,000	623,200	611,900	598,400	604,800	603,800	597,800	586,800	601,900	572,100	622,800
Kansas	101,600	110,800	112,200	117,300	127,400	136,200	116,700	110,100	114,600	110,700	108,400	103,200	114,100
Louisiana	54,600	62,000	60,500	62,600	58,900	63,700	65,200	66,000	65,400	67,900	69,400	68,700	63,800
Oklahoma	654,100	630,100	624,500	664,000	684,000	652,300	579,600	548,700	551,800	544,600	503,200	484,100	593,100
Texas	793,900	829,900	823,800	835,900	838,100	841,600	830,400	815,900	771,700	769,200	725,900	676,100	795,800
Wyoming	47,400	49,500	51,600	51,100	50,100	47,500	46,400	48,900	50,600	50,300	48,500	45,800	48,900
All others	156,500	168,400	160,000	171,200	175,000	172,800	183,500	167,600	169,500	170,400	158,700	160,600	167,800
	2,568,800	2,653,200	2,523,400	2,582,800	2,597,700	2,568,700	2,481,400	2,413,900	2,373,900	2,351,400	2,265,200	2,160,400	2,460,300

Arkansas.—The year 1930 was a rather uneventful one in the oil fields of Arkansas, and production continued to decline. The total output in 1930 amounted to 19,702,000 barrels, a decrease of 20.9 per cent from 1929 and equivalent to only about one-quarter of the output in the peak year of 1925. The Smackover field continued to yield the major portion of the State's output; the ratio of its output to the total for the State rose from 76.2 per cent in 1929 to 78.2 per cent in 1930. Production in the other fields of the State declined in 1930, except for that in Mount Holly, which was not discovered until the latter half of 1929.

The only new find of importance in Arkansas was the discovery of oil in the formations underlying the shallow gas field at Urbana. This field yielded 236,000 barrels of oil in 1930 from six wells. The Mount Holly field proved a disappointment, as its output for the year totaled only 34,000 barrels.

The total number of oil wells completed in Arkansas amounted to 46, less than half the total in 1929. The number of producing wells fell from 3,900 on January 1, 1930, to 3,850 on December 31, 1930. The average production per well per day was 13.9 barrels, as compared with 16.2 barrels in 1929.

Prospecting or "wildcatting" was at a very low ebb in Arkansas in 1930. One of the few "wildcats" to strike oil was located in Miller County and was important because it marked the first discovery in that county and supplied considerable information relative to future possibilities for finding petroleum in the Trinity formation of Lower Cretaceous age.

The average value per barrel at the wells in Arkansas in 1930 amounted to $0.88, the same as in 1929. In general, posted prices of Arkansas crudes increased 5 cents per barrel in April but suffered a material reduction late in October.

The number and total capacity of the refineries in Arkansas remained practically unchanged throughout 1930, but the daily average capacity of the operating plants rose from 41,500 barrels on January 1 to 46,000 barrels at the end of the year. The consumption of crude at the refineries in Arkansas in 1930 amounted to 9,845,000 barrels, as compared with 10,440,000 barrels in 1929. Comparatively little crude was shipped into Arkansas from other States. Approximately one-half of the production is refined within the State; the remainder moves southward into Louisiana. The major portion of the crude produced in Arkansas is of low gravity and contains comparatively little gasoline but a high proportion of fuel oil and asphalt. Consequently, the realization to refiners in Arkansas is influenced chiefly by the price of fuel oil, particularly in the Chicago district, and by the demand for asphalt and road oil.

Petroleum produced in Arkansas, 1921–1930, by districts

[Thousands of barrels of 42 U. S. gallons]

Year	Bradley	Champagnolle	El Dorado	Irma	Lisbon	Mount Holly	Smackover	Stephens	Urbana	Total
1921			10,473							10,473
1922			10,592				2,107	13		12,712
1923			5,830	(1)			30,048	[1] 732		36,610
1924			4,760	450			40,000	818		46,028
1925			4,247	334			72,144	673		77,398
1926	52		2,722	763	2,125		52,063	607		58,332
1927	44	(2)	[2] 2,433	774	1,054		35,201	499		40,005
1928	31	3,522	2,456	536	566		24,569	416		32,096
1929	24	2,651	1,987	409	492	(3)	[3] 18,991	363		24,917
1930	19	1,486	1,424	380	399	34	15,405	319	236	19,702

[1] Irma included with Stephens.

[2] Champagnolle included with El Dorado.

[3] Mount Holly included with Smackover.

Petroleum produced in Arkansas, 1930, by districts and months

[Thousands of barrels of 42 U. S. gallons]

District	Petroleum transported from producing properties													Oil consumed on leases plus net change in producers' stocks, Jan. 1-Dec. 31	Production
	January	February	March	April	May	June	July	August	September	October	November	December	The year		
Bradley	2	1	1	2	1	1	1	1	2	1	2	4	19		19
Champagnolle	148	126	142	130	140	128	117	110	108	107	102	128	1,486		1,486
El Dorado	116	118	124	121	124	125	121	124	117	116	113	116	1,435	−11	1,424
Irma	18	18	27	33	57	37	39	38	34	31	27	21	380		380
Lisbon	34	37	37	37	37	34	34	30	31	31	29	30	401	−2	399
Mount Holly	4	4	4	3	2	3	2	3	3	2	2	2	34		34
Smackover	1,312	1,352	1,422	1,368	1,254	1,291	1,299	1,283	1,222	1,230	1,143	1,189	15,365	40	15,405
Stephens	25	26	28	28	28	27	28	26	27	27	24	26	320	−1	319
Urbana				10	30	28	43	28	26	24	20	27	236		236
	1,659	1,682	1,785	1,732	1,673	1,674	1,684	1,643	1,570	1,569	1,462	1,543	19,676	26	19,702

California.—According to the State Department of Natural Resources, the production of crude petroleum in California in 1930 was 227,329,000 barrels, a decline of 22.3 per cent from the previous year. The figures of the California office of the American Petroleum Institute, which are used by the Bureau of Mines in its monthly reports, show a total output of 228,100,000 barrels, which is slightly more than the figure of the State Department of Natural Resources.

Production in California in 1930 was greatly influenced by the various curtailment programs. The total first recommended by the curtailment committee as the daily allowable production was approximately 609,000 barrels. This total was progressively lowered as it became apparent that demand was not going to meet expectations and as the actual production continued materially to exceed the allowable quota.

The major portion of the decrease in production in California in 1930 occurred in the two leading fields, Santa Fe Springs and Long Beach. Production in the former remained at a comparatively high level during the first quarter of the year but declined rapidly thereafter, following various curtailment efforts and the partial failure to find commercial production in the deeper sands. The total output of the field in 1930 totaled 44,038,000 barrels, as compared with 77,019,000 barrels in 1929. Production in the Long Beach field was stimulated by deep drilling and extensions, particularly in the Los Cerritos or northwest section of the field. However, the new production in no way compensated for the decline in the major portion of the field and for the amount held back by curtailment, and the total output fell from 60,869,000 barrels in 1929 to 36,773,000 barrels in 1930.

The only field in the Los Angeles Basin that showed a material gain in output in 1930 was the Playa del Rey or Venice field, discovered late in 1929. The development of this field was conservative until the latter half of the year, when an intensive drilling campaign took place in the town-lot area. The field reached a peak of nearly 50,000 barrels daily in December; its total output in 1930 amounted to 4,467,000 barrels, as compared with only 25,000 barrels in 1929. More oil wells were completed in the Playa del Rey field in 1930 than in any other field of the State, but on the whole the field was regarded as a distinct disappointment.

Despite a decline in output the Midway-Sunset field again ranked third among the California fields; it produced 23,422,000 barrels in 1930, as compared with 25,108,000 barrels in 1929. Production in the other fields of the San Joaquin Valley increased, due chiefly to gains at Mount Poso and Round Mountain.

Production in the Ventura Avenue field declined from 21,005,000 barrels in 1929 to 17,409,000 barrels in 1930. This decrease resulted primarily from adherence to the curtailment program. The loss at Ventura Avenue was more than offset by a gain at Elwood. Although drilling at Elwood in 1930 was not particularly active from the standpoint of number of wells the high average daily initial yield of the completed wells—3,946 barrels—was an important factor in an increase in output from 9,452,000 barrels in 1929 to 14,618,000 barrels in 1930. The structure in this field and at Rincon extends under the ocean, and some of the completions in these two fields were located on long piers.

The total output of the Kettleman Hills field, rated as the most important field in the State from the standpoint of oil and gas reserves, increased from 1,969,000 barrels in 1929 to 6,176,000 barrels in 1930. Several important events took place in this field in 1930; chief among them were the completion of several large wells on fee land on the North Dome, the subsequent agreement to prorate these wells, and the discovery that wells yielding black crude of normal gravity (34° to 42° A. P. I.) with a low gas-oil ratio could be obtained by drilling deep into the Temblor zone.

Wildcatting was active in California in 1930, but the results were uniformly unsuccessful. Many wildcats were drilled along the coast in an effort to find another Elwood but the results obtained were negative. Considerable success was attained in prospecting for deeper zones. Among the fields in which new deep sands were discovered were Ventura Avenue, Cerritos (Long Beach), Coyote, Belridge, and Lost Hills. The deep-sand developments in the Belridge and Lost Hills fields were initiated largely because of the success attained at Kettleman Hills. Improved technique, as evidenced by the ability to drill as deep as 10,000 feet and pump from 7,500 or more feet, was a controlling factor in these deep-sand explorations. Only one new field of importance was discovered in California in 1930—the Weed Patch or Mountain View field southeast of Bakersfield.

Posted prices of most grades of refinable crude in California advanced substantially on March 11 but lost part of this gain when prices were lowered on September 15. The only case of panic prices was in the Playa del Rey field, where some crude was reported to have sold for as low as 25 cents per barrel. The posted price of heavy grades of crude, however, remained at a low level throughout the year.

The number of oil wells completed in California in 1930 totaled 755, as compared with 910 in 1929. The Playa del Rey field led in number of oil wells completed, with Santa Fe Springs and Long Beach in second and third places, respectively. The lack of success attending wildcatting was evidenced by the fact that 123 dry holes were drilled in the miscellaneous counties but that no commercial oil wells were completed.

Approximate data for the distribution of crude oil in California in 1930 are as follows: Production and withdrawals from stocks of light crude, 228,000,000 barrels; runs to stills, 204,800,000 barrels; exports, 8,400,000 barrels; consumed as fuel, added to heavy crude stocks, losses, etc., 14,800,000 barrels. When compared with 1929 these figures represent chiefly a material decline in refinery activity, which was necessary to prevent further accumulation in stocks of gasoline.

Petroleum produced in California, 1930, by districts and months [1]

[Thousands of barrels of 42 U. S. gallons]

District	January	February	March	April	May	June	July	August	September	October	November	December	The year
1929													
Coalinga	286	268	286	278	290	281	286	287	274	288	270	279	3,373
Coyote	355	334	336	311	317	310	308	340	326	313	312	328	3,890
Dominguez	333	310	283	291	325	302	319	311	299	319	297	305	3,694
Elk Hills	520	479	548	606	611	580	557	560	535	542	526	508	6,572
Elwood	915	1,217	1,209	1,319	1,533	1,311	1,380	1,328	1,128	1,116	1,077	1,073	14,606
Fruitvale	97	78	64	58	79	80	76	70	70	81	75	75	903
Fullerton	410	375	420	380	392	367	369	361	347	342	330	330	4,423
Huntington Beach	1,272	1,148	903	854	884	855	894	905	869	879	847	798	11,108
Inglewood	681	614	551	523	533	516	537	541	512	466	470	485	6,429
Kern River	629	548	477	469	466	430	432	416	381	379	359	364	5,350
Kettleman Hills	403	369	399	422	459	432	417	416	661	760	759	712	6,209
Long Beach	3,298	3,187	3,082	3,098	2,949	2,792	3,104	3,203	3,012	3,041	2,920	2,914	36,600
Los Angeles-Salt Lake	50	44	47	45	47	45	47	48	47	44	41	41	546
Lost Hills-Belridge	155	144	75	68	70	68	68	70	68	145	181	202	1,314
McKittrick	148	132	132	127	122	117	116	125	120	121	118	112	1,490
Midway-Sunset	2,257	2,122	2,118	2,006	1,973	1,881	1,984	1,948	1,846	1,842	1,779	1,731	23,487
Montebello	267	241	218	219	221	217	226	222	213	221	221	227	2,713
Mount Poso	390	378	308	357	308	396	339	327	287	265	264	265	3,884
Playa del Rey	41	--------	--------	12	77	128	254	382	582	785	1,210	1,249	4,720
Potrero	24	20	29	40	75	119	58	62	60	50	53	48	638
Richfield	437	409	332	298	293	269	274	282	272	271	266	241	3,644
Rincon	108	87	90	84	94	80	77	76	77	73	78	79	1,003
Rosecrans	215	191	211	192	214	207	210	217	193	195	190	200	2,435
Round Mountain	87	83	100	118	110	111	116	121	124	125	94	6	1,195
Santa Fe Springs	5,302	5,018	4,650	3,842	3,720	3,391	3,478	3,376	3,059	2,936	2,816	2,663	44,251
Santa Maria	111	96	96	94	107	99	111	112	89	79	77	82	1,153
Seal Beach	930	871	744	705	680	612	648	622	567	581	540	527	8,027
Torrance	391	346	376	356	353	348	361	345	337	320	304	280	4,117
Ventura Avenue	1,606	1,540	1,375	1,359	1,503	1,449	1,526	1,473	1,399	1,430	1,414	1,419	17,493
Ventura-Newhall	159	148	155	149	152	144	146	141	150	151	138	139	1,772
Whittier	46	41	44	42	44	43	44	44	42	42	42	43	517
Other	60	48	42	47	43	41	40	40	38	42	41	62	544
	21,983	20,886	19,700	18,769	19,044	18,021	18,802	18,771	17,984	18,244	18,109	17,787	228,100
Division of Mines, Department of Natural Resources, California [2]	21,898	20,805	19,624	18,696	18,970	17,951	18,749	18,717	17,933	18,192	18,058	17,736	227,329

[1] Monthly figures by districts from American Petroleum Institute.
[2] Monthly figures prorated from annual and semiannual reports.

Petroleum produced in California, 1926–1930, by counties [1]

[Thousands of barrels of 42 U. S. gallons]

County	1926	1927	1928	1929	1930
Fresno	7,340	7,202	4,611	3,498	3,363
Kern	54,550	51,570	44,097	43,577	44,171
Kings	(2)	(2)	199	1,969	6,176
Los Angeles	105,826	103,626	120,549	182,444	114,533
Orange	37,989	46,594	37,101	25,862	23,114
San Luis Obispo	28	17	15	(2)	(2)
Santa Barbara	1,925	2,174	3,078	11,142	15,914
Santa Clara	[3] 21	[4] 16	[5] 18	[6] 38	[7] 75
Ventura	16,994	19,997	22,143	24,004	19,983
	224,673	231,196	231,811	292,534	227,329

[1] Division of Mines, Department of Natural Resources, California.
[2] Included under Santa Clara.
[3] Includes Kings, San Bernardino, San Mateo, and Sonoma.
[4] Includes Colusa, Kings, San Bernardino, San Mateo, and Sonoma.
[5] Includes Colusa and San Mateo.
[6] Includes Colusa and San Luis Obispo.
[7] Includes Colusa, San Luis Obispo, and Tulare.

Petroleum produced in California, 1930, by fields

[Barrels of "clean oil," from Division of Mines, Department of Natural Resources, California]

Field	Jan. 1 to June 30	July 1 to Dec. 31	Total
District No. 1:			
Beverly Hills	65,741	64,715	130,456
Brea Olinda	2,321,773	2,088,800	4,410,573
Coyote Hills	1,941,731	1,905,321	3,847,052
Dominguez	1,851,895	1,846,157	3,698,052
Huntington Beach	5,882,735	5,327,726	11,210,461
Inglewood	3,428,385	3,020,707	6,449,092
Lawndale	83,188	55,167	138,355
Long Beach	18,578,045	18,194,863	36,772,908
Montebello	1,372,551	1,321,566	2,694,117
Newhall	90,221	92,842	183,063
Newport	5,040	4,079	9,119
Playa del Rey	264,832	4,201,871	4,466,703
Potrero	208,404	322,808	531,212
Richfield	2,019,212	1,617,403	3,636,615
Rosecrans	1,196,741	1,200,707	2,397,448
Salt Lake	147,635	139,230	286,865
Santa Fe Springs	25,693,768	18,344,091	44,037,859
Seal Beach	4,509,206	3,430,006	7,939,212
Torrance	2,187,468	1,957,431	4,144,899
Whittier	258,019	256,936	514,955
	72,106,590	65,392,426	137,499,016
Los Angeles City field	[1] 86,000	[1] 86,000	172,000
District No. 2:			
Bardsdale	115,599	113,693	229,292
Ojai	12,908	15,025	27,933
Piru	72,084	89,138	161,222
Rincon	539,090	459,847	998,937
Santa Paula	11,244	11,870	23,114
Sespe	22,623	20,582	43,205
Simi	20,719	22,980	43,699
South Mountain	547,086	500,297	1,047,383
Ventura	8,848,202	8,560,354	17,408,556
	10,189,555	9,793,786	19,983,341
District No. 3:			
Arroyo Grande	18,528	25,967	44,495
Casmalia	9,799	9,025	18,824
Cat Canyon	232,490	151,447	383,937
Elwood	7,511,721	7,106,021	14,617,742
Lompoc	17,705	16,235	33,940
San Luis Obispo County—Huasna district	1,744	1,698	3,442
Santa Barbara County—			
El Capitan district	8,632	17,886	26,518
Mesa district	1,479	24,774	26,253
More district	283	----------------	283
Santa Maria	363,109	346,750	709,859
Summerland	57,460	39,316	96,776
	8,222,950	7,739,119	15,962,069

Petroleum produced in California, 1930, by fields—Continued

[Barrels of "clean oil" from Division of Mines, Department of Natural Resources, California]

Field	Jan. 1 to June 30	July 1 to Dec. 31	Total
District No. 4:			
Belridge	370, 624	680, 644	1, 051, 268
Elk Hills	3, 333, 751	3, 221, 473	6, 555, 224
Fruitvale	459, 066	456, 831	915, 897
Kern County		2, 434	2, 434
Kern River	2, 922, 764	2, 284, 849	5, 207, 613
Lost Hills	222, 614	63, 269	285, 883
McKittrick-Temblor	751, 722	692, 500	1, 444, 222
Midway-Sunset	12, 287, 212	11, 134, 745	23, 421, 957
Mount Poso	2, 125, 846	1, 740, 597	3, 866, 443
Round Mountain	601, 485	599, 147	1, 200, 632
Tulare		2, 820	2, 820
Wheeler Ridge	110, 552	108, 685	219, 237
	23, 185, 636	20, 987, 994	44, 173, 630
District No. 5:			
Coalinga	1, 676, 855	1, 686, 047	3, 362, 902
Kettleman Hills	2, 476, 888	3, 699, 242	6, 176, 130
	4, 153, 743	5, 385, 289	9, 539, 032
Grand total	[1] 117, 944, 474	[1] 109, 384, 614	227, 329, 088

[1] Semiannual figures for Los Angeles City field estimated.

Colorado.—Production in Colorado fell from 2,358,000 barrels in 1929 to 1,656,000 barrels in 1930. This material decrease resulted from a decline in drilling and from curtailed production. Only 13 oil wells were completed in the State in 1930 as compared with 33 in 1929. Wildcatting was fairly active during the year, with the result that one oil field and several new gas areas were discovered. The oil field, named Greasewood after the dome on which it was found, is in Weld County near Orchard, which is about 50 miles northeast of Denver. This discovery was particularly interesting from a geological standpoint, because the structure with its gentle dips was quite unlike the usual steeply dipping domes found in the Rocky Mountain States. Although the field was discovered too late in 1930 to have much effect upon production the discovery was regarded as important and presaged considerable development in 1931.

Colorado is self-sustaining as to crude requirements—that is, the total output is more than sufficient to cover refinery requirements—and little, if any, crude is shipped into the State. Approximately one-half of the production in 1930 was refined within the State; the other half was shipped out by tank car or added to storage. Only three refineries operated in Colorado in 1930.

Petroleum produced in Colorado, 1921–1930, by districts

[Thousands of barrels of 42 U. S. gallons]

Year	Boulder	Florence	Fort Collins [1]	Iles Dome	Moffat	Rangely	Tow Creek	Total
1921	5	83				20		108
1922	4	70				23		97
1923	4	62				20		86
1924	4	70	86		256	29		445
1925	3	97	430	17	605	32	42	1, 226
1926	2	148	1, 222	24	1, 199	33	140	2, 768
1927	(2)	[3] 291	1, 260	263	670	[4] 69	278	2, 831
1928	(2)	[3] 430	1, 030	626	464	[4] 34	190	2, 774
1929	(2)	[3] 344	824	546	436	[5] 35	173	2, 358
1930	(2)	[3] 200	485	382	394	[6] 47	148	1, 656

[1] Includes Wellington.
[2] Included with Rangely.
[3] Includes Canon City.
[4] Includes Boulder and Walden.
[5] Includes Berthoud, Boulder, and Walden.
[6] Includes Berthoud, Boulder, Greasewood, and Walden.

Petroleum produced in Colorado, 1930, by districts and months

[Thousands of barrels of 42 U. S. gallons]

District	Petroleum transported from producing properties													Oil consumed on leases plus net change in producers' stocks, Jan. 1–Dec. 31	Production
	January	February	March	April	May	June	July	August	September	October	November	December	The year		
Boulder Rangely [1]	2	2	3	3	3	2	3	4	5	3	5	11	46	1	47
Florence [2]	14	24	20	18	19	17	17	15	15	15	14	13	201	−1	200
Fort Collins [3]	53	47	47	43	43	40	37	37	34	35	35	35	486	−1	485
Iles Dome	27	29	28	28	31	31	34	33	32	33	30	32	368	14	382
Moffat	26	32	30	29	28	28	35	31	28	34	31	30	362	32	394
Tow Creek	17	12	12	14	13	12	12	11	11	11	10	13	148		148
	139	146	140	135	137	130	138	131	125	131	125	134	1, 611	45	1, 656

[1] Includes Berthoud, Greasewood, and Walden.
[2] Includes Canon City.
[3] Includes Wellington.

Illinois.—Production in Illinois in 1930 reflected adverse economic conditions and declined 9.2 per cent from 1929. The production for the year was 5,736,000 barrels, the lowest since 1906. The number of oil wells completed totaled 117, as compared with 314 in 1929. This decline in drilling activity and the inauguration of a curtailment program on September 1 were the chief causes of the decline in output in 1930. The Dupo field continued to be the most interesting district, although the number of oil wells completed there during 1930 constituted only a fraction of the 1929 total. In general, crude produced in Illinois is refined entirely within the State. However, the amount produced is sufficient to take care of only about 15 per cent of the State's refinery requirements. The major portion of the deficit is covered by receipts of Mid-Continent oil through the several trunk lines that enter Illinois from the southwest. The average price received per barrel at the wells by the Illinois producers was $1.59 in 1930, as compared with $1.65 in 1929.

Petroleum produced in Illinois, 1926–1930, by months

[Thousands of barrels of 42 U. S. gallons]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The year
1926	635	600	729	579	650	662	680	670	657	651	616	631	7, 760
1927	589	558	698	536	601	602	576	607	577	557	562	531	6, 994
1928	510	516	635	468	573	550	551	573	506	558	508	514	6, 462
1929	508	455	603	457	552	517	561	572	532	566	506	490	6, 319
1930	487	478	532	511	540	513	531	523	409	428	378	406	5, 736

Indiana.—Production in Indiana was maintained in 1930; in fact, the output registered a small gain over that in the previous year. The total produced was 994,000 barrels, as compared with 981,000 barrels in 1929. The major portion of the output continued to come from the pools in the southwestern part of the State. The pools in the northeast corner of the State, which form part of the so-called Lima-Indiana field, produced only 53,000 barrels in 1930. Unlike Illinois, drilling in Indiana was more active than in 1929, and 81 oil wells were completed, as compared with 67 in 1929. The major portion of this activity centered in Pike County. Indiana resembles Illinois in crude requirements; that is, the refinery capacity far exceeds the production within the State. Only five plants were operating in Indiana in 1930, but they were so large that, had they operated solely on Indiana crude, the supply would have lasted only about one week. All the refineries are in the East Chicago area and receive practically all their crude through pipe lines from the Mid-Continent area.

Petroleum produced in Indiana, 1926–1930, by months

[Thousands of barrels of 42 U. S. gallons]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The year
Southwestern Indiana:													
1926	54	55	50	54	57	56	56	54	54	53	56	59	658
1927	55	59	55	53	59	60	60	66	63	66	64	66	726
1928	70	75	71	75	81	78	81	86	82	88	87	89	963
1929	83	81	77	76	78	71	72	75	71	78	78	78	918
1930	74	80	77	87	87	85	89	88	69	70	67	68	941
Northeastern Indiana:													
1926	10	13	14	13	13	14	14	14	13	12	9	11	150
1927	9	12	12	12	12	13	11	10	10	9	8	8	126
1928	7	8	7	8	9	8	7	8	7	8	6	6	89
1929	4	4	6	6	6	7	5	5	5	5	5	5	63
1930	4	4	4	5	6	5	5	4	5	5	3	3	53
Total Indiana:													
1926	64	68	64	67	70	70	70	68	67	65	65	70	808
1927	64	71	67	65	71	73	71	76	73	75	72	74	852
1928	77	83	78	83	90	86	88	94	89	96	93	95	1, 052
1929	87	85	83	82	84	78	77	80	76	83	83	83	981
1930	78	84	81	92	93	90	94	92	74	75	70	71	994

Kansas.—Production in Kansas remained fairly constant during 1930, and the total output amounted to 41,638,000 barrels or about 1,000,000 barrels under that in 1929. If several of the flush fields, particularly Voshell, had not been prorated, the total output in 1930 undoubtedly would have exceeded the record of 45,451,000 barrels, established in 1918 when Eldorado was at its peak.

Unlike the majority of States Kansas had no outstanding field or district which produces a material part of the output. The leading producing county in 1930 was Butler, with Sedgwick second. The leading pools were Wright in Sedgwick County and Voshell in McPherson County. The Voshell field was discovered in August, 1929, but did not assume importance until March, 1930, when deep production was found in the siliceous lime. The potential of the field rose to nearly 100,000 barrels late in the year, although actual production never rose to much more than 20,000 barrels daily. The Ritz pool of McPherson County and the Eastborough field of Sedgwick County were new and important factors in production in Kansas in 1930. Both were discovered before 1930 but were slow in revealing their true possibilities. The trend of production in the older fields in the southeast corner of the State was downward, although enough new production was obtained to make the 1930 total almost equal to that of the preceding year.

Wildcatters were active in Kansas in 1930, and a number of important discoveries were made. The major portion of the exploratory work was confined to what is commonly referred to as western Kansas but is actually central Kansas; this area includes Rice, Ellsworth, Stafford, Barton, Russell, and Rooks Counties. Of these, Ellsworth, Stafford, and Barton were added to the ranks of the oil-producing counties in 1930; the prospects for the others were greatly increased by new discoveries. The Schurr pool in Rice County assumed considerable importance after a number of large wells were completed, but developments were held back chiefly by lack of transportation facilities. Considerable drilling was done in southwest Kansas in 1930, but nearly all of this was in connection with establishing a gas reserve in the Hugoton field of Stevens and Morton Counties.

The number of oil wells completed in Kansas in 1930 totaled 445, as compared with 553 in 1929. Although this indicates considerable lessening in activity the average size of the completions was much larger than in 1929, and the shut-in production showed a consistent increase. The number of gas wells completed rose from 52 in 1929 to 168 in 1930; this rise reflected chiefly the drilling in the Hugoton field, already mentioned.

Kansas is an important refining State, although the crude requirements of its 13 to 15 operating plants amount to only slightly more than three-fourths of the production. Crude runs to stills in 1929 and 1930 were 34,848,000 and 33,890,000 barrels, respectively. Receipts from other States, principally Oklahoma, amounted to approximately 4,500,000 barrels. Deliveries from Kansas to Oklahoma and Missouri were 2,000,000 and 12,000,000 barrels, respectively. Part of the latter is consumed in Missouri, but the major portion moves into Illinois and other States farther east.

Petroleum produced in Kansas, 1930, by districts and months [1]

[Thousands of barrels of 42 U. S. gallons]

District	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The year
Anderson	51	49	54	47	49	47	46	46	44	46	43	44	566
Butler:													
Eldorado	190	180	211	202	212	203	209	209	195	211	196	196	2,414
Leon Weaver	151	132	146	128	123	116	123	130	116	131	127	124	1,547
Other	426	389	441	428	452	429	431	420	432	458	420	412	5,138
Cowley:													
Rainbow Bend	38	34	47	48	56	51	51	55	52	52	48	49	581
Winfield-New Salem	59	55	57	58	59	57	54	55	57	54	49	49	663
Other	66	59	64	65	69	67	64	67	65	68	59	58	771
Greenwood-Woodson:													
Seely	230	189	239	219	229	218	224	222	217	217	183	168	2,555
Teeter-Pixley-Scott	143	108	122	124	126	120	125	120	120	122	117	108	1,455
Virgil	162	152	170	168	176	168	165	158	166	168	163	128	1,944
Other	108	106	118	110	112	108	115	112	109	112	105	97	1,312
McPherson:													
Ritz	------	------	------	23	159	148	134	117	135	156	162	155	1,189
Voshell	------	------	------	537	671	639	401	305	300	267	243	396	3,759
Other	90	139	312	4	5	4	4	6	11	9	41	31	656
Russell	120	106	116	116	121	116	117	117	111	101	98	90	1,329
Sedgwick:													
Eastborough	------	------	------	------	------	------	------	102	162	241	365	317	1,187
Wright	571	508	533	510	510	450	423	402	283	343	295	276	5,104
Other	139	128	138	133	120	118	144	104	98	115	102	90	1,429
Sumner	258	230	252	282	281	266	289	279	273	283	271	261	3,225
Other	471	402	484	532	448	440	422	466	460	418	372	384	5,299
	3,273	2,966	3,504	3,734	3,978	3,765	3,541	3,492	3,406	3,572	3,459	3,433	42,123
Bureau of Mines [2]	3,149	3,103	3,477	3,520	3,948	4,087	3,618	3,414	3,439	3,432	3,252	3,199	41,638

[1] Monthly estimates by districts from Oil and Gas Journal.

[2] Separation by fields not available.

Kentucky.—Production in Kentucky in 1930 amounted to 7,389,000 barrels, a decrease of 5 per cent from that in the previous year. This loss was due chiefly to low prices and to a partial shutdown in the Owensboro field. The number of oil wells completed fell from 897 in 1929 to 633 in 1930, but the average initial production of the completions was larger than in the preceding year. As in 1929, the major portion of the drilling was done in Ohio and Daviess Counties. The outstanding event of the year was the discovery of a sizable pool in Hart County, where the wells had an average daily initial output of 282 barrels, which is unusually high for Kentucky. A total of 88 wells was drilled in the pool before the close of the year; of these, 59 were oil wells, 13 were gas wells, and 16 were dry holes.

The daily crude-oil capacity of the eight refineries which operated in Kentucky in 1930 was approximately 28,000 barrels. If these plants had operated at capacity all year they would have consumed more than 10,000,000 barrels of crude oil, which is considerably in excess of the total produced within the State. Actually, they utilized 5,811,000 barrels, or somewhat less than the production. Small amounts of crude are shipped into Kentucky from Indiana and Tennessee, but the principal source is the Mid-Continent area; the latter supplied about 1,800,000 barrels in 1930. On the other hand, small shipments are made to West Virginia, but the major delivery is to Illinois; the latter amounted to about 3,000,000 barrels in 1930.

Petroleum produced in Kentucky, 1926–1930, by months

[Thousands of barrels of 42 U. S. gallons]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The year
1926	499	485	531	517	522	526	549	540	532	536	521	516	6, 274
1927	509	490	549	540	559	558	586	612	587	588	586	555	6, 719
1928	542	558	623	618	653	563	681	662	594	660	608	597	7, 359
1929	585	511	560	584	636	547	710	676	722	810	724	710	7, 775
1930	665	604	625	643	663	609	676	610	621	608	524	541	7, 389

Louisiana.—Louisiana was one of the comparatively few States where crude production increased in 1930; its output rose from 20,554,000 barrels in 1929 to 23,272,000 barrels in 1930. Production in Louisiana comes from two distinct districts—the northern fields and the coastal or salt-dome fields. In general, the output of the northern fields has been declining, while that of the coastal fields has increased steadily.

In 1930 the production of the northern district rose to 14,662,000 barrels from 13,100,000 barrels in 1929. This gain resulted chiefly from increased output in the Zwolle and Sarepta-Carterville fields. The yield in all the older fields of the northern district declined, despite the moderate success that attended deeper drilling. Production in the Haynesville field was stimulated by the introduction of repressuring, and its output was only slightly below that in 1929. Except for the discovery of a number of new gas fields the exploratory work in the northern district in 1930 was not particularly successful. One new field, Holly, was brought in, but it proved disappointing when developed. The Zwolle field was probably the most active area in Louisiana in 1930. Although the lenticular nature of the producing sands at Zwolle resulted in a high percentage of failures, enough large wells were brought in to maintain interest in the field.

The Louisiana salt-dome fields—about 20 in number—produced 8,610,000 barrels of crude in 1930, or 37 per cent of the total output of the State. Geophysical work decreased in the Louisiana Gulf coast in 1930, and new discoveries were few. The major portion of the new production obtained in this district in 1930 resulted from a material gain at Port Barre and from increases in the Black Bayou, Lake Barre, Vinton, and White Castle fields.

The number of wells drilled in Louisiana rose from 965 in 1929 to 1,042 in 1930. The number of dry holes drilled totaled 440, or nearly 100 more than the 347 oil wells completed. (See p. 864.)

The average value per barrel of the Louisiana coastal crudes fell from $1.23 in 1929 to $1.07 in 1930; crudes from the northern district fell in price from $1.26 to $1.15 in the same period; and the average value for the State fell from $1.25 to $1.12.

Crude runs to stills in Louisiana in 1930 totaled 51,649,000 barrels, a decline of 21 per cent from 1929. Approximate figures for the distribution of crude in Louisiana in 1930 follow: Production, 23,000,000 barrels; receipts from Arkansas, 10,000,000 barrels; receipts from Oklahoma, 24,000,000 barrels; receipts from Texas, 8,000,000 barrels; imports from foreign countries, 3,000,000 barrels;

runs to stills, 52,000,000 barrels; shipments to Texas, 8,000,000 barrels; and exports, 400,000 barrels; the remainder was used for fuel or shipped to the East coast.

All the foreign crude and the major portion of the domestic crude were processed at the four refineries in the coastal district. On January 1, 1931, these refineries had a total daily average crude oil-capacity of 140,000 barrels, as compared with a total capacity of only 53,000 barrels for the six plants operating in the northern district.

Petroleum produced in Louisiana, 1921–1930, by districts

[Thousands of barrels of 42 U. S. gallons]

District	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Gulf coast (salt-dome pools)										
Anse la Butte	47	36	18	12	17	17	17	16	14	9
Bayou Bouillon	------	------	------	------	------	------	------	205	72	78
Black Bayou	------	------	------	------	------	------	------	------	(1)	177
Edgerley	250	125	157	166	185	207	467	358	245	161
Hackberry	------	------	------	------	------	------	42	1, 149	1, 783	1, 213
Jennings	254	191	204	213	278	342	299	250	515	495
Lake Barre	------	------	------	------	------	------	------	------	46	388
Lockport	------	------	------	128	471	1, 343	2, 038	1, 445	1, 369	1, 131
Port Barre	------	------	------	------	------	------	------	------	33	970
Sorrento	------	------	------	------	------	------	------	289	110	30
Starks	------	------	------	------	------	------	262	186	170	206
Sulphur	------	------	------	------	------	------	(1)	890	1, 374	1, 362
Sweet Lake	------	------	------	------	------	(1)	77	661	93	193
Vinton	1, 379	1, 395	2, 071	1, 968	2, 274	2, 215	1, 786	1, 569	1, 484	1, 768
White Castle	------	------	------	------	------	------	------	------	(1)	300
Other	------	------	------	------	[2] 2	[3] 16	[4] 62	[5] 35	[6] 146	[7] 129
	1, 930	1, 747	2, 450	2, 487	3, 227	4, 140	5, 050	7, 053	7, 454	8, 610
Northern										
Bellevue	------	1, 050	2, 351	1, 749	1, 129	788	472	323	255	233
Caddo	5, 342	4, 498	4, 178	4, 319	4, 067	4, 749	5, 789	4, 798	[8] 4, 589	4, 120
Cotton Valley	------	------	------	1, 211	3, 348	2, 914	1, 968	1, 731	1, 040	880
De Soto	719	531	429	353	305	321	541	463	276	247
Elm Grove	------	160	220	217	212	222	222	185	178	172
Haynesville	3, 161	19, 939	10, 496	6, 720	4, 604	3, 328	2, 600	2, 150	1, 806	1, 743
Holly	------	------	------	------	------	------	------	------	------	308
Homer	13, 030	5, 673	3, 581	2, 837	2, 296	2, 033	1, 785	1, 548	1, 405	1, 278
Pleasant Hill	------	------	------	------	------	------	------	------	(9)	178
Red River (Bull Bayou, Crichton)	2, 844	1, 778	1, 207	1, 231	1, 074	1, 037	1, 070	1, 109	987	838
Sarepta	------	------	------	------	------	------	------	------	(8)	[10] 888
Urania	------	------	------	------	10	3, 669	3, 321	2, 487	2, 155	1, 976
Zwolle	------	------	------	------	------	------	------	------	[9] 409	1, 801
Other	77	------	7	------	------	------	------	------	------	------
	25, 173	33, 629	22, 469	18, 637	17, 045	19, 061	17, 768	14, 794	13, 100	14, 662
	27, 103	35, 376	24, 919	21, 124	20, 272	23, 201	22, 818	21, 847	20, 554	23, 272

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[1] Included under "Other."
[2] Welsh.
[3] Sweet Lake and Welsh.
[4] Iberia, Sulphur, and Welsh.
[5] Iberia and Welsh.
[6] Bayou Bleu, Black Bayou, Dog Lake, Lake Pelto, Welsh, and White Castle.
[7] Bayou Bleu, Caillou Island, Dog Lake, Lake Pelto, and Welsh.
[8] Carterville and Sarepta included with Caddo.
[9] Pleasant Hill included with Zwolle.
[10] Includes Carterville.

Petroleum produced in Louisiana, 1930, by districts and months

[Thousands of barrels of 42 U. S. gallons]

District	Petroleum transported from producing properties													Oil consumed on leases plus net change in producers' stocks, Jan. 1-Dec. 31	Production
	January	February	March	April	May	June	July	August	September	October	November	December	The year		
Gulf coast (salt-dome pools)															
Bayou Bouillon	2	1	15	13	8	4	4	12	4	7	5	1	76	2	78
Black Bayou	-----	-----	11	5	-----	24	22	9	10	26	33	32	172	5	177
Edgerley	16	15	16	13	18	14	12	12	13	11	11	10	161	------	161
Hackberry	95	82	78	101	96	90	92	110	106	86	102	132	1, 170	43	1, 213
Jennings	33	25	23	19	18	45	65	59	54	61	55	19	476	19	495
Lockport	87	89	84	83	91	73	90	88	75	100	130	130	1, 120	11	1, 131
Port Barre	24	57	49	60	73	95	110	114	107	98	73	64	924	46	970
Starks	18	12	13	13	12	16	17	19	21	20	18	19	198	8	206
Sulphur	105	160	148	99	145	93	103	94	73	101	81	96	1, 298	64	1, 362
Vinton	114	104	114	110	119	149	166	173	192	205	157	158	1, 761	7	1, 768
White Castle	13	9	13	9	13	39	33	37	38	28	32	31	295	5	300
Other[1]	11	24	27	44	35	33	39	80	74	79	100	91	637	112	749
	518	578	591	569	628	675	753	807	767	822	797	783	8, 288	322	8, 610
Northern															
Bellevue	17	19	20	20	21	20	20	19	20	23	15	18	232	1	233
Caddo	371	355	375	369	302	353	360	350	330	337	309	316	4, 127	−7	4, 120
Cotton Valley	76	79	74	82	73	70	74	70	71	75	68	70	882	−2	880
De Soto	20	20	21	21	22	21	22	20	21	20	19	20	247	------	247
Elm Grove	14	14	14	14	15	13	15	15	15	15	14	15	173	−1	172
Haynesville	134	129	138	138	140	142	149	136	156	161	146	184	1, 753	−10	1, 743
Holly	-----	-----	15	34	30	39	38	32	30	29	32	29	308	------	308
Homer	110	101	110	109	111	105	107	106	105	106	101	106	1, 277	1	1, 278
Pleasant Hill	20	19	18	18	16	15	14	13	12	11	11	11	178	------	178
Red River (Bull Bayou, Crichton)	73	67	74	74	71	69	69	70	69	67	67	68	838	------	838
Sarepta[2]	20	56	94	101	102	109	106	83	62	64	45	46	888	------	888
Urania	168	167	177	182	163	170	165	164	162	158	149	154	1, 979	−3	1, 976
Zwolle	122	129	122	122	95	93	106	127	130	204	267	280	1, 797	4	1, 801
	1, 145	1, 155	1, 252	1, 284	1, 161	1, 219	1, 245	1, 205	1, 183	1, 270	1, 243	1, 317	14, 679	−17	14, 662
	1, 663	1, 733	1, 843	1, 853	1, 789	1, 894	1, 998	2, 012	1, 950	2, 092	2, 040	2, 100	22, 967	305	23, 272

[1] Includes Anse la Butte, Bayou Bleu, Caillou Island, Dog Lake, Lake Barre, Lake Pelto, Sorrento, Sweet Lake, and Welsh.

[2] Includes Carterville.

Michigan.—Production in Michigan in 1930 declined from that in 1929, as the increased output in the Mount Pleasant district did not compensate for the sharp decline at Muskegon. The total output was 3,911,000 barrels, as compared with 4,528,000 barrels in 1929. Although many of the gas wells at Muskegon were drilled deeper and became oil wells in the Dundee formation the field declined rapidly. On the other hand, the Mount Pleasant field, more conservatively and scientifically developed, showed a material gain in output in 1930. Wildcatting was particularly active over the State, and numerous oil and gas shows were discovered. The Mount Pleasant area was extended by the discovery of the Seaton and Vernon pools. A number of gas discoveries were made. Deep drilling in the Muskegon field was generally disappointing.

The number of oil wells completed fell from 348 in 1929 to 151 in 1930, due almost entirely to decreased activity in the Muskegon field; in fact, the number of oil wells completed outside of that field rose from 84 in 1929 to 131 in 1930.

Before oil was discovered in commercial quantities at Saginaw, there were no refineries in Michigan. A refinery was built at Zilwaukee in 1927, and several small plants were constructed in the Muskegon field when it was at its peak. Later a plant was built at Trenton near Detroit. The consumption of crude at refineries within the State increased from 1,472,000 barrels in 1929 to 3,310,000 barrels in 1930. As more than half of the total in 1930 consisted of Mid-Continent crude, a considerable portion (3,911,000 barrels) of the production for that year was shipped outside the State. Part of this movement was consigned to refineries near Toledo, and nearly 1,000,000 barrels were exported to Canada.

Petroleum produced in Michigan, 1927–1930, by districts

[Thousands of barrels of 42 U. S. gallons]

Year	Mount Pleasant	Muskegon	Saginaw	Total
1927	----------	(1)	[1] 439	439
1928	(2)	338	[2] 256	594
1929	1,394	3,019	115	4,528
1930	2,599	1,223	89	3,911

[1] Muskegon included with Saginaw.

[2] Mount Pleasant included with Saginaw.

Petroleum produced in Michigan, 1930, by districts and months

[Thousands of barrels of 42 U. S. gallons]

District	Petroleum transported from producing properties													Oil consumed on leases plus net change in producers' stocks, Jan. 1-Dec. 31	Production
	January	February	March	April	May	June	July	August	September	October	November	December	The year		
Mount Pleasant	250	246	224	233	217	221	247	226	173	176	182	194	2,589	10	2,599
Muskegon	161	140	146	119	111	108	101	67	71	68	67	66	1,225	−2	1,223
Saginaw	9	8	8	8	8	8	8	7	7	7	4	7	89	------	89
	420	394	378	360	336	337	356	300	251	251	253	267	3,903	8	3,911

Montana.—Production in Montana continued to decline and in 1930 amounted to 3,349,000 barrels, as compared with 3,980,000 barrels in 1929. The output of practically all the fields decreased in 1930, the decline being only partly neutralized by increased production in the Border, Bannatyne, and Dry Creek fields. The inauguration of proration in the Kevin-Sunburst and Pondera fields late in the year and a drastic reduction in drilling were contributory causes of the decline in output in 1930. The most important event of the year in Montana was the discovery of deep production in the Dakota series on the Dry Creek Dome.

The distribution of crude petroleum produced in Montana consists essentially of deliveries to refineries within the State and exports to Canada. There are about 20 refineries in the State, but they are almost all small. Total runs to stills amounted to 2,443,000 barrels in 1930, compared with 2,650,000 barrels in 1929. Exports to Canada from Montana declined from 1,750,000 barrels in 1929 to 1,722,000 barrels in 1930; however, a large part of these exports consisted of crude from Wyoming.

Petroleum produced in Montana, 1921–1930, by districts

[Thousands of barrels of 42 U. S. gallons]

Year	Cat Creek	Elk Basin	Kevin-Sunburst	Lake Basin	Pondera	Other	Total
1921	1,408	75	-----	-----	-----	26	1,509
1922	2,333	46	36	-----	-----	34	2,449
1923	2,227	28	523	-----	-----	4	2,782
1924	1,572	24	1,217	-----	-----	2	2,815
1925	1,255	21	2,780	31	-----	4	4,091
1926	1,015	19	6,630	63	-----	-----	7,727
1927	[1] 779	17	4,214	48	-----	-----	5,058
1928	[1] 613	20	3,189	43	150	-----	4,015
1929	[1] 497	19	2,378	29	1,057	-----	3,980
1930	418	16	[2] 2,118	23	739	[3] 35	3,349

[1] Includes small amounts from Bannatyne and Devils Basin.
[2] Includes Border.
[3] Includes Bannatyne and Dry Creek.

Petroleum produced in Montana, 1930, by districts and months

[Thousands of barrels of 42 U. S. gallons]

District	Petroleum transported from producing properties													Oil consumed on leases plus net change in producers' stocks, Jan. 1–Dec. 31	Production
	January	February	March	April	May	June	July	August	September	October	November	December	The year		
Cat Creek	35	35	36	35	36	34	36	35	33	33	33	34	415	3	418
Elk Basin	1	1	1	1	1	2	2	2	1	1	1	2	16	-----	16
Kevin-Sunburst [1]	159	167	172	189	190	178	185	201	169	148	169	174	2,101	17	2,118
Lake Basin	2	2	1	2	2	2	2	2	2	2	2	2	23	-----	23
Pondera	62	58	59	70	75	69	70	66	53	53	52	50	737	2	739
Other [2]	-----	-----	-----	-----	-----	-----	5	4	4	3	3	13	32	3	35
	259	263	269	297	304	285	300	310	262	240	260	275	3,324	25	3,349

[1] Includes Border.
[2] Includes Bannatyne and Dry Creek.

New Mexico.—Production in New Mexico in 1930 amounted to 10,189,000 barrels, or nearly six times that in 1929. The relative increase in production was by far the largest recorded by any State in 1930 and resulted chiefly from the development of the Hobbs field into one of major importance. The Hobbs field yielded 6,525,000 barrels, as compared with less than 100,000 barrels in 1929. The first wells completed at Hobbs were relatively small, but after the structure was delineated wells with an initial production of 20,000 or more barrels daily were completed. The combined average daily initial yield of all the 1930 completions at Hobbs exceeded 7,000 barrels. After the first large well was completed in January the development of the Hobbs field proceeded rapidly, but an agreement was reached to prorate the field in July.

The other fields of Lea and Eddy Counties, with the exception of Artesia, also showed a very material increase in output in 1930. The fields of northwest New Mexico, including chiefly Rattlesnake and Hogback, showed a small decline in output in 1930 as drilling fell to a low ebb.

The capacity of the refineries in New Mexico represents an almost negligible factor in the industry. There are several small plants in the northwest corner of the State and several in the vicinity of Artesia, but their total crude requirements amounted to less than 1,000,000 barrels in 1930. A comparatively small amount of crude was shipped out of New Mexico to Utah via Colorado in 1930, but the major portion was transported to the Texas Gulf coast via several pipe-line systems which were continued into Lea County from the west Texas fields.

Petroleum produced in New Mexico, 1925–1930, by districts

[Thousands of barrels of 42 U. S. gallons]

Year	Artesia	Hobbs	Hogback	Lea	Rattlesnake[1]	Total
1925	748	----------	187	----------	125	1,060
1926	1,016	----------	221	2	427	1,666
1927	582	----------	223	39	382	1,226
1928	410	----------	169	69	295	943
1929	323	(2)	120	[3] 899	488	1,830
1930	261	6,525	159	[4] 2,782	462	10,189

[1] Includes Bloomfield in 1925; Bloomfield and Table Mesa in 1926; Bloomfield, Hospah, and Table Mesa in 1927 and 1928; Hospah and Table Mesa in 1929; and Table Mesa in 1930.
[2] Included with Lea.
[3] Includes Hobbs, Jal, Maljamar, and other pools in Lea County.
[4] Includes Jal, Maljamar, and other pools in Lea and Eddy Counties.

Petroleum produced in New Mexico, 1930, by districts and months

[Thousands of barrels of 42 U. S. gallons]

District	Petroleum transported from producing properties													Oil consumed on leases plus net change in producers' stocks, Jan. 1-Dec. 31	Production
	January	February	March	April	May	June	July	August	September	October	November	December	The year		
Artesia	22	22	22	23	23	22	22	22	17	25	21	20	261	------	261
Hobbs	54	1	1	11	224	409	1,015	948	945	970	920	948	6,446	79	6,525
Hogback	14	11	13	14	12	13	15	14	12	13	13	15	159	------	159
Lea	233	234	276	275	280	249	236	241	206	188	164	201	2,783	−1	2,782
Rattlesnake[1]	39	35	23	41	30	39	43	40	48	43	43	25	449	13	462
	362	303	335	364	569	732	1,331	1,265	1,228	1,239	1,161	1,209	10,098	91	10,189

[1] Includes Table Mesa.

New York.—Production in New York in 1930 amounted to 3,647,000 barrels, an increase of 8 per cent over 1929 and the largest annual total since 1883. Production reached its peak in May but fell off rapidly thereafter, due to curtailment and reduced prices. Separate figures for wells in New York are not available, but it is fairly certain that drilling activity materially declined in 1930. There are 4 refineries in New York; 2 are near the producing fields, 1 at Buffalo, and 1 on Long Island. These refineries consumed a total of 10,903,000 barrels of crude oil in 1930, as compared with 10,538,000 barrels in 1929. In 1930 nearly 1,000,000 barrels of crude were shipped into Pennsylvania, about 2,800,000 barrels of Mid-Continent and Pennsylvania oil were received over the State line from Pennsylvania, and a small amount was exported. The excess of consumption and deliveries over production plus pipe-line receipts was approximately 5,500,000 barrels in 1930. This was made up by tanker shipments from Texas and by a small quantity of imports.

Petroleum produced in New York, 1926–1930, by months

[Thousands of barrels of 42 U. S. gallons]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The year
1926	147	141	158	165	156	162	174	167	171	176	158	181	1, 956
1927	169	169	195	185	191	189	184	200	192	189	187	192	2, 242
1928	185	181	195	192	211	225	200	230	219	249	251	265	2, 603
1929	262	240	267	277	295	284	301	285	282	288	281	315	3, 377
1930	314	327	369	373	392	326	275	213	263	285	248	262	3, 647

Ohio.—Production in Ohio in 1930 totaled 6,486,000 barrels, a decline from the previous year of 4 per cent and the third successive decrease in annual output in the State. The major portion of the decline occurred in the Lima field in northwestern Ohio. Production in the light-oil areas of central and eastern Ohio held up well until the middle of the year, when proration and lowered prices brought on a general decline. Licking County and its neighbor to the east, Muskingum County, were the two most active areas in Ohio in 1930. Development work over the State as a whole fell off, the number of oil wells completed declining from 1,135 in 1929 to 909 in 1930. Ohio has always been one of the leading gasoline-consuming States, but the development of the refining industry within the State has been held back by the comparative lack of a near-by crude supply. This situation has been alleviated by the expansion of pipe-line facilities from the Mid-Continent district and, to a smaller extent, by the development of production in Michigan. The greatest concentration of refinery equipment is in Toledo, whose location affords cheap water transportation along Lake Erie. There are now about a dozen operating plants in Ohio capable of running more than 100,000 barrels of crude daily.

The actual runs to stills totaled 18,812,000 barrels, in 1930, compared with 21,379,000 barrels in 1929. The major portion of this crude originates in the Mid-Continent field and comes into the State through pipe lines over the Indiana State line. The quantity so received in 1930 amounted to about 30,000,000 barrels, of which roughly 10,000,000 barrels were shipped eastward into Pennsylvania and West Virginia, 8,000,000 barrels were shipped to Michigan for export or refining, and 12,000,000 barrels were retained at refineries within the State.

Petroleum produced in Ohio, 1926–1930, by months

[Thousands of barrels of 42 U. S. gallons]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The year
Central and eastern Ohio:													
1926	410	406	471	447	438	472	463	464	452	449	449	471	5,392
1927	454	453	536	502	527	512	487	518	492	482	473	448	5,884
1928	445	441	480	455	492	471	462	473	416	466	418	415	5,434
1929	431	388	442	441	456	431	489	430	422	468	423	438	5,259
1930	446	423	436	464	463	450	457	402	417	441	367	408	5,174
Northwestern Ohio:													
1926	147	145	165	158	163	181	169	160	156	154	137	145	1,880
1927	131	144	158	144	149	158	145	149	143	144	123	121	1,709
1928	117	123	138	129	154	149	152	137	122	133	110	117	1,581
1929	104	95	122	119	128	145	159	148	120	129	110	105	1,484
1930	101	112	109	120	123	120	121	107	109	108	86	96	1,312
Total Ohio:													
1926	557	551	636	605	601	653	632	624	608	603	586	616	7,272
1927	585	597	694	646	676	670	632	667	635	626	596	569	7,593
1928	562	564	618	584	646	620	614	610	538	599	528	532	7,015
1929	535	483	564	560	584	576	648	578	542	597	533	543	6,743
1930	547	535	545	584	586	570	578	509	526	549	453	504	6,486

Oklahoma.—Production in Oklahoma in 1930 amounted to 216,486,000 barrels, a decline of 38,518,000 barrels from the previous year and the lowest annual output since 1926. The decline was fairly general throughout the State and occured despite a material gain in potential output. It is generally agreed that if some form of proration had not been practiced in the flush fields of Oklahoma in 1930 the output would have established a new record for the State. The largest decline in production was recorded in the Greater Seminole area; in fact, the output of the remainder of the State increased.

Overshadowing all other developments in Oklahoma was the rapid growth in activity in the Oklahoma City field. This field was discovered in 1928, but because of the depth of the producing sands less than 30 oil wells were completed before January 1, 1930. In 1930, however, drilling progressed rapidly, and nearly 600 oil wells were completed in the field before the end of the year. A few of these wells were reported as 100,000-barrel wells; as a group they had the unusually high average daily initial yield of 8,107 barrels, undoubtedly a record for such a large number of completions. The field was found to extend under the city, and a town-lot drilling campaign ensued. The heavy gas pressures encountered in most of the wells made drilling hazardous, and several disastrous blow-outs occurred. Despite several suits contesting the authority of the Corporation Commission to prorate the field production was maintained at market requirements.

Production at Oklahoma City comes from the Simpson and Wilcox sands and from the siliceous lime of Arbuckle age. The best wells have been "sand" wells; the "lime" wells have declined quite rapidly, and most of them now show considerable water. The production of the field in 1930 amounted to 34,603,000 barrels, which made it second only to Seminole as a producing district.

Production in the Greater Seminole district, including Asher-Wanette, Konawa, and Sasakwa, amounted to 87,821,000 barrels, which, although a material decline from the previous year, represents the largest quantity in any district in the State. The chief cause of the decrease at Seminole was the natural decline of the wells, although curtailment and a general falling off in development work were contributing factors.

There was a general falling off in development work in Oklahoma in 1930, although the large number of completions in the Oklahoma City field caused a slight increase in the total oil wells brought in. Lowered prices and a general surplus of oil dampened the enthusiasm of wildcatters, and the number of tests put down decreased materially. The center of prospecting continued to move westward, and drilling was carried progressively deeper. Important discoveries were made in Garfield and Logan Counties. The old Cement pool was extended both laterally and vertically. Two new producing areas, South Earlsboro and Wanette, were found in the Greater Seminole district, and although neither came up to expectations they yielded considerable new production in 1930. Interest in the Wewoka field, first discovered nearly 20 years ago, was revived upon the completion of large wells in a deeper sand.

The average value at the wells of the crude petroleum produced in Oklahoma in 1930 was $1.29 per barrel, compared with $1.43 in 1929. In general, posted prices in Oklahoma in 1930 weakened early in the year, rallied in April, but dropped severely in October. The last posting brought the price of an average grade of oil (38° to 38.9° gravity) down to practically $1 a barrel.

Oklahoma is an important refining State, although it ranks relatively higher as a producer. The bureau's refinery survey of January 1, 1931, showed that there were 58 refineries within the State, with a total daily crude-oil capacity of 346,600 barrels. These plants utilized a total of 72,172,000 barrels of crude oil in 1930, as compared with 75,239,000 barrels run to stills in 1929. The crude oil run to stills in the State in 1930 was only one-third of the output in that year, an indication that the State is an important source of supply for the refining industry in other States.

The major movement of crude from Oklahoma is toward the Illinois-Indiana-Ohio district via Kansas and Missouri. This movement amounted to about 74,000,000 barrels in 1930. Large amounts of Oklahoma crude move into Texas and Louisiana (via Arkansas) for refining or for transportation to the East coast. In 1930 shipments of Oklahoma crude to Louisiana amounted to about 24,000,000 barrels, and those to Texas to about 46,500,000 barrels. Shipments of Oklahoma crude to Kansas refineries in 1930 amounted to about 4,000,000 barrels, and nearly 2,000,000 barrels were exported to Canada in tank cars. The excess of runs to stills plus deliveries over production (more than 4,000,000 barrels) was supplied by withdrawals from storage, by receipts from Kansas, and by the comparatively small amount of Texas crude which was not passed on for shipment to the Illinois-Indiana-Ohio territory.

Petroleum produced in Oklahoma, 1930, by districts and months[1]

[Thousands of barrels of 42 U. S. gallons]

District	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The year
Allen	750	611	592	601	662	611	554	480	464	440	416	399	6, 580
Asher-Wanette	80	64	71	63	101	158	149	219	275	261	362	278	2, 081
Braman	114	98	108	105	104	99	97	101	91	88	54	56	1, 115
Bristow, Kelleyville, and Depew	412	376	423	405	419	375	398	400	355	378	362	375	4, 678
Burbank	519	470	504	483	504	483	490	486	449	475	441	413	5, 717
Cement	65	59	93	82	97	144	122	123	118	114	147	143	1, 307
Cromwell	226	208	244	229	233	225	229	228	213	217	189	164	2, 605
Cushing-Shamrock	451	389	435	419	426	415	433	431	412	422	375	372	4, 980
Duncan	145	123	133	131	137	132	135	134	124	133	125	127	1, 579
Eastern Bristow	166	152	154	154	151	146	140	138	133	131	131	132	1, 728
Fox-Graham	155	138	149	146	146	139	140	141	135	138	98	100	1, 625
Garber	135	129	147	138	135	129	144	143	142	140	126	131	1, 639
Glenn	200	186	205	198	205	198	198	205	190	198	193	197	2, 373
Healdton	370	338	371	358	378	357	372	374	362	366	278	285	4, 209
Henryetta, Deaner-Lyons	194	170	214	212	213	204	192	211	201	191	178	180	2, 360
Hewitt	230	204	223	214	228	219	225	216	211	215	156	160	2, 501
Konawa	94	95	260	254	495	668	692	560	521	560	434	467	5, 100
Lovell-Marshall	339	275	255	214	175	173	153	140	137	137	98	100	2, 196
Oklahoma City	2, 551	2, 498	2, 305	3, 245	3, 874	3, 404	2, 667	3, 095	3, 022	2, 874	2, 459	2, 609	34, 603
Osage (outside Burbank)	716	636	711	681	710	686	682	661	745	756	713	699	8, 396
St. Louis-Pearson	1, 464	1, 231	1, 274	1, 113	1, 059	870	867	829	737	742	689	692	11, 567
Sasakwa	394	267	343	347	278	248	211	174	150	167	142	135	2, 856
Seminole	7, 814	6, 258	6, 631	6, 412	6, 407	6, 356	5, 394	4, 364	4, 265	4, 407	3, 776	4, 133	66, 217
Sholem-Alechem	427	381	431	403	407	397	440	419	423	449	334	341	4, 852
Tonkawa	258	211	237	229	228	219	200	196	187	188	147	132	2, 432
Wewoka	130	114	117	111	115	111	121	126	107	108	145	124	1, 429
Other	2, 404	2, 297	2, 485	2, 594	2, 700	2, 589	2, 588	2, 568	2, 340	2, 338	2, 374	2, 113	29, 390
	20, 803	17, 978	19, 115	19, 541	20, 587	19, 755	18, 033	17, 162	16, 509	16, 633	14, 942	15, 057	216, 115
Bureau of Mines[2]	20, 276	17, 643	19, 361	19, 919	21, 204	19, 570	17, 967	17, 010	16, 553	16, 882	15, 095	15, 006	216, 486

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[1] Monthly estimates by districts from Oil and Gas Journal.
[2] Separation by fields not available.

Pennsylvania.—Production in Pennsylvania continued its steady increase in 1930, and the total rose from 11,820,000 barrels in 1929 to 12,803,000 barrels, an output that represents the highest recorded for the State since 1900. As usual, the Bradford field, which extends over the line into New York, experienced the major portion of the development; however, drilling in this field was materially curtailed in 1930 due to low prices and to the fact that no new wells were needed to take care of the demand.

Water flooding under the 5-point method has been carried on so successfully in the Bradford field that a pronounced state of overproduction existed there in the second half of 1929 and in the first half of 1930. This condition was reflected in posted prices of Pennsylvania-grade crude oil, which showed four successive declines in the second half of 1929 and three more in the first half of 1930. This material decline in prices focused the attention of the producers upon the necessity of balancing supply and demand and led to the formation of a General Conservation Board in May.

Prospecting in Pennsylvania in 1930 was at a comparatively low level, and new discoveries were few. Much of the wildcatting has as its objective the opening of new gas horizons. These efforts were rewarded by the discovery of the Tioga field near the New York State line in Tioga County. The fields of southwest Pennsylvania were quiet during the year; the drop in prices dampened the ardor of most operators.

According to the Pennsylvania Department of Internal Affairs, the total production of the State amounted to 13,005,709 barrels, of which 9,268,679 barrels (71 per cent) were credited to McKean County, in which the Bradford field is located. In 1929 the McKean County output was 66 per cent of the total, and the proportionate gain in 1930 indicates the growth in relative importance of the Bradford field.

The refining industry in Pennsylvania has shown two separate stages of development: (1) The building of many comparatively small plants in the western part of the State that operate on crude from the surrounding fields and specialize in lubricating oils; and (2), the construction of a few large refineries in the general vicinity of Philadelphia, which operate almost entirely on crude shipped in by water. On January 1, 1931, there were 49 refineries within the State, with a daily crude-oil capacity of 251,530 barrels. These plants utilized 59,551,000 barrels of crude oil in 1930, compared with 53,697,000 barrels in 1929. Of the total crude oil consumed in 1930 nearly 13,000,000 barrels were produced within the State and 46,000,000 barrels were brought in by water. The deficiency of about 1,000,000 barrels in supply represents the net receipts by pipe lines from Ohio and West Virginia; that is, the excess of pipe-line receipts from the West over deliveries to New Jersey and New York.

Petroleum produced in Pennsylvania, 1926–1930, by months

[Thousands of barrels of 42 U. S. gallons]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The year
1926	654	650	726	748	748	777	784	783	772	802	760	757	8, 961
1927	718	728	842	799	812	824	789	830	805	820	793	766	9, 526
1928	768	770	842	792	884	836	838	860	795	893	828	850	9, 956
1929	851	805	913	943	1, 020	953	1, 037	1, 043	972	1, 120	1, 053	1, 110	11, 820
1930	1, 162	1, 127	1, 217	1, 298	1, 312	1, 109	939	862	911	1, 008	946	912	12, 803

Petroleum produced in Pennsylvania, 1926–1930, by counties, in barrels [1]

County	1926	1927	1928	1929	1930
Allegheny	422, 797	406, 771	375, 062	349, 497	326, 050
Armstrong	19, 718	19, 420	18, 319	19, 564	34, 435
Beaver	84, 296	81, 198	77, 153	71, 744	66, 112
Butler	689, 782	677, 004	646, 942	679, 752	606, 211
Clarion	209, 965	190, 365	189, 740	195, 665	178, 839
Crawford	64, 523	75, 235	79, 482	99, 614	104, 759
Elk	88, 419	86, 213	85, 643	92, 058	86, 736
Fayette	----------	----------	----------	1, 721	----------
Forest	137, 078	127, 814	160, 577	102, 017	103, 271
Greene	439, 576	370, 612	228, 199	276, 263	244, 495
Jefferson	21, 167	7, 687	6, 744	5, 966	6, 187
Lawrence	19, 348	27, 319	24, 921	21, 435	31, 044
McKean	[2] 2, 962, 698	5, 535, 157	5, 901, 394	7, 734, 945	9, 268, 679
Mercer	14, 401	14, 031	15, 489	22, 022	16, 070
Potter	7, 395	6, 860	8, 849	3, 122	5, 863
Tioga	2, 441	----------	----------	----------	----------
Venango	1, 161, 924	1, 214, 568	1, 147, 047	1, 291, 487	1, 132, 969
Warren	313, 808	343, 315	299, 282	315, 322	317, 025
Washington	449, 493	455, 807	500, 019	490, 142	476, 964
	[2] 7, 108, 829	9, 639, 376	9, 764, 862	11, 772, 336	13, 005, 709
Bureau of Mines	[2] 8, 961, 000	9, 526, 000	9, 956, 000	11, 820, 000	12, 803, 000

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[1] Department of Internal Affairs, Pennsylvania.

[2] Differences in totals due mainly to differences in production recorded for McKean County.

Tennessee.—Production in Tennessee amounted to 21,000 barrels in 1930, compared with 19,000 barrels in 1929. Little development work was done in the State in 1930, and the only completions were gas wells. No refineries were operating in Tennessee in 1930; the production was shipped to refineries in Kentucky.

Petroleum produced in Tennessee, 1926–1930, by months

[Thousands of barrels of 42 U. S. gallons]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The year
1926	3	4	3	5	4	4	3	2	5	3	4	3	43
1927	5	4	3	4	5	4	5	9	5	6	6	4	60
1928	2	4	5	4	5	2	5	8	4	2	3	2	46
1929	2	2	1	3	2	1	2	2	1	2	1	------	19
1930	2	1	1	1	2	1	3	3	1	1	3	2	21

Texas.—The output in Texas registered a small decline in 1930, but the State continued to rank first among the producing States. The total output was 290,457,000 barrels, compared with 296,876,000 barrels in 1929. Production in west Texas, the leading producing district of the State, fell off approximately 25,000,000 barrels in 1930; but this decrease was more than offset by gains in the salt-dome pools, at Van, and in the Darst Creek field.

Oil has been discovered in practically all the geographical divisions of Texas. A few of these districts are geologically related; but, in general, they are a considerable distance apart and differ widely in grade of oil, size and depth of wells, and type of producing formations. These differences have led to the delineation of a number of general districts, as follows: Texas Panhandle, north central Texas, east and central Texas, Texas Gulf coast, southwest Texas, and west Texas. Developments in these districts in 1930 will be discussed in the order indicated.

Production in the Texas Panhandle—that is, in Carson, Gray, Hutchinson, Moore, Potter, and Wheeler Counties—amounted to 31,777,000 barrels in 1930, a small increase over the previous year. Several curtailment programs were applied in the Panhandle in 1930, each one reducing the total allowable for the area. Drilling in 1930 was at practically the same rate as in 1929, with 343 oil wells completed, as compared with 351 in 1929. Of the completions in 1930, 246 (72 per cent) were in Gray County. The old Borger pool, which easily ranks first among the Panhandle fields in cumulative output, was comparatively quiet during the year, and abandonments probably exceeded completions. The most active fields were the Bowers and Finley pools in Gray County. Wildcatting fell off in 1930, and most of the new discoveries proved erratic performers.

Production in north central Texas, which includes the areas often referred to as north Texas and west central Texas, declined materially in output in 1930, as drilling and the demand for crude decreased. The amount produced fell from 52,046,000 barrels in 1929 to 44,301,000 barrels in 1930, a drop of 15 per cent. The decline in the monthly figures was more pronounced; for example, between May and December the production fell from a daily average of 140,000 barrels to hardly more than 80,000 barrels.

In spite of a material increase in drilling in Young County, the number of oil wells completed in north central Texas in 1930 (2,909) was 29 per cent below that in 1929. Young County was the most active area in the district in 1930, although considerable difficulty was experienced in obtaining pipe-line connections for the new wells. The most important new discovery was the Riggs (Larimore) pool located near New Castle in Young County. Other discoveries were made which might have proved important producers if there had been a market for the oil.

The east and central Texas district witnessed two interesting developments in 1930. One was the advance of Van field into a district of major importance; the other was the discovery of the so-called "East Texas" field, which was to become so important in 1931. The output of the Van field totaled 7,330,000 barrels, compared with only 144,000 barrels in 1929. However, the 1930 output represented only a small part of what the field probably would have produced if controlled operation had not been followed. A total of 171 oil wells was completed in Van Zandt County in 1930, nearly all of which were located in the Van pool. The many efforts to find other fields in the vicinity of Van were generally unsuccessful.

The other major development, the discovery of the "East Texas" field, occurred in October, with the completion of a small well in northwest Rusk County. Although this well opened the area, it did not receive particular attention until large wells were completed, 1 mile west and 10 miles north of the original well, just before the year closed.

Production in the fields of central Texas, excluding Van but including the fields along the Balcones fault and scattered pools like Boggy Creek, Thrall, Pettus, and Calliham, showed a material gain in 1930. This gain resulted primarily from the increase at Darst Creek which, although prorated most of the year, yielded 11,424,000 barrels in 1930, compared with 243,000 barrels in 1929. Production in the other fault-line pools fell off; the decrease at Salt Flat was particularly rapid. Important producing areas were opened up with the discovery of the Chapman field, a serpentine area in Williamson County, and the Pettus field in Bee County. Bee and Goliad Counties were the scene of considerable wildcatting, and several promising discoveries were made. Kerr County entered the ranks of the oil counties in 1930 upon the completion of a small producer. This discovery opened up a large amount of new territory for prospecting.

Production in the Texas Gulf coast district rose to a new peak in 1930, when the annual total amounted to 61,066,000 barrels, compared with 49,652,000 barrels in 1929. The Gulf coast district, including the Texas and the Louisiana Gulf coasts, occupied a unique position in the industry in 1930 in that it was about the only district with a material amount of flush production that was not prorated. Development work was restricted, however, which, coupled with a falling off in town-lot drilling at Refugio, led to a substantial reduction in output as the year progressed.

The leading producing field in the Texas Gulf coast in 1930 was Refugio, where the output rose rapidly as one deep sand after another was discovered. The peak was reached in April at slightly over 40,000 barrels daily; the total output for the year was 11,485,000 barrels, compared with 1,990,000 barrels in 1929. Second to Refugio in output was Barbers Hill, which has been of increasing importance since deep sands were discovered late in 1928. This field produced 7,441,000 barrels in 1930, compared with 4,552,000 barrels in 1929. A feature of the development at Barbers Hill was the discovery that oil could be produced by drilling through the salt. It was found that this oil existed in the regular producing formations under a ledge of salt. This discovery opened the possibility of finding a similar condition in the other producing salt domes. The output of the old Spindletop field declined materially, but it ranked third among the Texas Gulf coast fields in 1930. Next to Spindletop in importance was the Humble field, in which important new flank production was discovered early in the year.

Geophysical work, which has been a feature of exploration in the Texas Gulf coast for several years, fell off decidedly in 1930, because practically all the shallow domes had been discovered and geophysical exploration of deep-seated structures has not been equally effective. Most of the wildcat drilling consisted of attempts to find deeper sands on the flanks of the old producing domes; this work was generally successful. One geophysical dome, Moss Bluff, was proved for production during the year. The number of completions in the Texas Gulf coast declined from 1,380 in 1929 to 1,065 in 1930; the number of oil wells brought in, from 866 to 686. The most active field from the standpoint of drilling was Refugio, with Barbers Hill and Humble in second and third places, respectively.

In spite of a material decline in output in 1930, west Texas continued to be the leading producing area in Texas. The production in west Texas totaled 108,730,000 barrels in 1930, compared with 133,328,000 barrels in 1929. Yates displaced Hendricks as the leading field in the west Texas district in 1930; together, they produced nearly two-thirds of the total. Production in the Yates field amounted to 41,338,000 barrels in 1930, or slightly less than in 1929. The field, which derived considerable fame from the size of its wells and its credited potential, was prorated throughout the year. Although many of the wells in the Yates field show some water the encroachment has been much slower than in fields less conservatively developed. Hendricks, the field ranking second, produced 26,404,000 barrels in 1930, hardly more than half the 1929 total. Although credited with a potential of 1,000,000 barrels in the middle of 1930, it was able to produce only 52,000 barrels in an actual test in December. The rapid decline of the Hendricks field has resulted primarily from water encroachment, which has caused many wells to be abandoned. The Crane-Upton fields were prorated in 1930; however, their output—14,451,000 barrels—compared favorably with that in 1929. The most important new factor in production in west Texas in 1930 was the Penn pool in Ector County. This field was quite active in 1930, when it produced more than 3,000,000 barrels. Several wells were completed in the deep zone at Big Lake; and the output of the field, which had declined steadily from 1926 to 1929, showed an increase. At the close of 1930 a number of interesting wildcats were drilling in west Texas with this deep zone as the objective, but there was considerable doubt as to the areal extent of the formation. Tubing was installed in the deep wells at Big Lake in 1930, and the amount of gas blown into the air was reduced materially. The "sweet" oil pool of Loving County was actively exploited during the year; 16 oil wells were completed in 1930, and the output of the pool for the year was 663,000 barrels. Reduced demand and low prices caused a severe slump in prospecting in west Texas in 1930, and the number of discoveries during the year was small. Interesting wells were completed in Ector, Andrews, and Crane Counties. The well in Crane County produced oil in commercial quantities after having passed through a strong flow of sulphur water. This well upset the common theory of what constitutes a failure in west Texas and opened up the possibility of redrilling certain areas that had been condemned.

Production in the fields of southwest Texas—that is, in the general vicinity of Mirando—increased from 3,850,000 barrels in 1929 to 4,138,000 barrels in 1930, or to practically the record level of 1926. Several discoveries were made in this area in 1930, the most promising of which was located in northwest Duval County.

In 1930 Texas displaced California as the leading State from the standpoint of crude runs to stills; however, Texas is still relatively more important as a producer of crude than as a consumer. There were about 100 refineries in Texas at the close of 1930, but only three-fourths of them operated throughout the year. These utilized 214,262,000 barrels of domestic crude and 1,050,000 barrels of foreign crude, compared with 208,820,000 barrels of domestic crude and 2,873,000 barrels of foreign crude processed in 1929.

In 1930 Texas received crude from the surrounding States, including the major portion of the output of New Mexico, a large amount from Oklahoma, and a smaller quantity from Louisiana. In general, these shipments are consigned to the Gulf coast, where they are refined, exported, or shipped to Atlantic seaboard refineries. Approximate totals for the distribution of crude in Texas in 1930 are as follows:

	Barrels		Barrels
Production	290,500,000	Runs to stills	215,300,000
Receipts from—		Shipments to—	
Oklahoma	46,500,000	East coast	108,000,000
New Mexico	9,500,000	Oklahoma (nearly all to refineries in East Chicago area)	34,000,000
Louisiana (including some Arkansas crude)	8,000,000	Louisiana	8,000,000
Imports	1,000,000	Exports by water	700,000
	355,500,000		366,000,000

The apparent deficiency in supply represents withdrawals from storage.

Petroleum produced in Texas, 1921–1930, by districts

[Thousands of barrels of 42 U. S. gallons]

District	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Gulf coast (salt-dome pools)										
Barbers Hill	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	4, 552	7, 441
Batson	495	434	403	464	432	456	462	550	444	418
Big Creek	------	(2)	(2)	293	310	520	1, 243	811	1, 496	1, 390
Blue Ridge	326	349	287	278	313	486	1, 210	2, 205	1, 194	644
Boling	------	------	------	------	40	1, 175	753	814	580	378
Damon Mound	666	754	628	520	416	341	312	291	224	224
Dayton	40	29	35	36	20	(2)	(2)	(2)	214	406
Esperson	------	------	------	------	------	------	------	------	(2)	819
Fannette	------	------	------	------	------	------	------	(2)	292	350
Goose Creek	[1] 4, 640	[1] 4, 766	[1] 6, 026	[1] 3, 967	[1] 3, 464	[1] 3, 501	[1] 3, 102	[1] 2, 726	2, 154	1, 690
Hankamer	------	------	------	------	------	------	------	------	(2)	546
High Island	------	------	------	------	121	60	96	163	449	331
Hull	8, 150	6, 546	7, 300	7, 074	6, 944	7, 058	5, 685	4, 055	3, 376	3, 128
Humble	3, 004	2, 284	2, 275	2, 224	1, 864	1, 568	1, 485	1, 242	2, 990	5, 859
Kingsville	------	------	------	------	------	------	146	153	120	41
Lost Lake	------	------	------	------	------	------	------	------	99	209
Markham	49	35	21	66	41	51	109	112	133	98
Moore	------	------	------	------	------	75	22	44	44	636
Nash	------	------	------	------	------	207	395	491	193	110
Orange	470	5, 345	4, 649	3, 958	4, 816	3, 458	1, 803	1, 415	1, 006	790
Piedras Pintas	------	------	------	------	17	93	(2)	------	------	------
Pierce Junction	1, 239	1, 020	313	154	265	948	2, 954	3, 899	5, 160	3, 847
Port Neches	------	------	------	------	------	------	------	------	242	672
Raccoon Bend	------	------	------	------	------	------	1	98	2, 084	3, 893
Refugio	------	------	------	------	------	------	------	(2)	1, 990	11, 485
Saratoga	1, 129	713	626	543	514	482	413	343	333	380
Sourlake	1, 802	1, 675	1, 906	1, 588	1, 444	2, 004	1, 593	1, 185	946	806
South Liberty	------	------	------	------	4, 416	1, 992	1, 084	1, 398	2, 137	1, 503
Spindletop	344	289	326	359	412	13, 441	20, 751	14, 150	10, 037	6, 176
Sugarland	------	------	------	------	------	------	------	390	3, 948	4, 274
West Columbia	12, 081	11, 126	5, 994	4, 536	4, 031	3, 197	3, 291	2, 800	2, 298	1, 827
Other	6	5	32	22	5	[3] 22	[4] 94	[5] 301	[6] 917	[7] 695
Total Gulf coast	34, 441	35, 370	30, 821	26, 082	29, 885	41, 135	47, 004	39, 636	49, 652	61, 066
Rest of State										
East and central Texas:										
Boggy Creek	------	------	------	------	------	------	15	331	1, 120	1, 133
Calliham	------	------	------	187	98	52	29	24	20	12
Darst Creek	------	------	------	------	------	------	------	------	[8] 243	11, 424
Luling	------	------	2, 248	11, 134	8, 979	7, 699	6, 169	[9] 5, 443	4, 948	3, 692
Lytton Springs	------	------	------	------	2, 603	1, 783	784	846	600	489
Manford	------	------	------	------	------	------	------	------	(8)	128
Mexia [10]	6, 137	34, 790	50, 827	49, 272	42, 353	20, 494	12, 417	8, 353	5, 969	4, 621
Pettus	------	------	------	------	------	------	------	------	------	1, 730
Salt Flat (Bruner)	------	------	------	------	------	------	------	(9)	13, 286	7, 305
Somerset-Medina	324	672	1, 030	1, 109	873	791	767	738	659	566
Thrall-Minerva-Chapman	52	37	247	235	255	535	508	337	251	1, 906
Van	------	------	------	------	------	------	------	------	144	7, 330
Other	48	35	38	59	58	36	43	51	128	109
Total east and central Texas	6, 561	35, 534	54, 390	61, 996	55, 219	31, 390	20, 732	16, 123	27, 368	40, 445
North central Texas [11]	65, 164	47, 037	43, 896	42, 487	46, 013	49, 932	54, 806	49, 459	52, 046	44, 301
Panhandle [12]	------	------	------	272	1, 132	25, 551	40, 253	25, 286	30, 632	31, 777
Southwest Texas [13]	------	733	1, 786	2, 215	2, 688	4, 150	3, 056	3, 276	3, 850	4, 138

[1] Barbers Hill included with Goose Creek prior to 1929.
[2] Included under "Other."
[3] Brenham and Dayton.
[4] Bernard, Brenham, Dayton, and Piedras Pintas.
[5] Bernard, Brenham, Dayton, Fannette, and Refugio.
[6] Allen, Clay Creek, Esperson, Hankamer, and Mykawa.
[7] Allen, Clay Creek, Corpus Christi, Moss Bluff, and Mykawa.
[8] Manford included with Darst Creek.
[9] Salt Flat included with Luling.
[10] Includes Corsicana, Nigger Creek, Powell, Richland, Wortham, and smaller fields in Falls, Freestone, Limestone, and Navarro Counties.
[11] Includes the districts in and between Wilbarger, Wichita, Clay, Montague, and Cooke Counties on the north and Runnels, Coleman, Brown, and Comanche Counties on the south.
[12] Carson, Gray, Hutchinson, Moore, Potter, and Wheeler Counties.
[13] Includes fields in Jim Hogg, Webb, and Zapata Counties and Duval County except salt-dome field at Piedras Pintas.

Petroleum produced in Texas, 1921–1930, by districts—Continued

[Thousands of barrels of 42 U. S. gallons]

District	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Rest of State—Continued										
West Texas:										
Big Lake	-------	-------	12	1,056	8,900	10,937	8,986	6,753	6,460	7,050
Chalk-Roberts	-------	-------	-------	-------	-------	(14)	1,072	[15] 5,736	[15] 15,633	[15] 11,999
Crane-Upton	-------	-------	-------	-------	-------	2,204	30,607	25,529	16,852	14,451
Ector	-------	-------	-------	-------	-------	-------	-------	-------	-------	3,168
Fisher	-------	-------	-------	-------	-------	-------	-------	(2)	418	532
Hendricks	-------	-------	-------	-------	-------	-------	3,641	62,045	50,179	26,404
Loving	-------	-------	-------	-------	-------	-------	-------	-------	-------	663
Taylor-Link	-------	-------	-------	-------	-------	-------	-------	-------	461	1,389
Ward	-------	-------	-------	-------	-------	-------	-------	-------	453	931
Westbrook	-------	10	118	414	811	[14] 1,372	1,365	(15)	(15)	(15)
World	-------	-------	-------	-------	-------	237	516	796	673	693
Yates	-------	-------	-------	-------	-------	(2)	5,329	22,429	41,905	41,338
Other	-------	-------	-------	-------	-------	8	22	252	294	112
Total West Texas	-------	10	130	1,470	9,711	14,758	51,538	123,540	133,328	108,730
Total Rest of State	71,725	83,314	100,202	108,440	114,763	125,781	170,385	217,684	247,224	229,391
Grand total	106,166	118,684	131,023	134,522	144,648	166,916	217,389	257,320	296,876	290,457

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[2] Included under "other."

[14] Westbrook includes Chalk and other small fields in Howard and Mitchell Counties.

[15] Chalk-Roberts includes Westbrook.

Petroleum produced in Texas (exclusive of salt-dome fields), 1930, by districts and months

[Thousands of barrels of 42 U. S. gallons]

District	Petroleum transported from producing properties													Oil consumed on leases plus net change in producers' stocks, Jan. 1–Dec. 31	Production
	January	February	March	April	May	June	July	August	September	October	November	December	The year		
East and central Texas:															
Boggy Creek	114	98	112	107	104	103	99	85	81	78	68	77	1,126	7	1,133
Calliham	1	1	1	1	1	1	1	1	1	1	1	1	12	----------	12
Darst Creek	421	441	492	596	839	842	1,209	1,411	1,333	1,480	1,081	1,098	11,243	181	11,424
Luling	318	294	327	309	329	312	322	311	280	310	287	287	3,686	6	3,692
Lytton Springs	40	40	48	50	42	41	43	40	36	38	32	38	488	1	489
Manford	18	12	16	16	14	10	10	6	9	7	5	5	128	----------	128
Mexia	398	379	411	399	397	389	392	375	363	373	358	382	4,616	5	4,621
Pettus	----------	----------	27	35	104	128	170	186	225	233	317	298	1,723	7	1,730
Salt Flat (Bruner)	805	701	692	632	643	764	639	517	476	471	459	471	7,270	35	7,305
Somerset-Medina	48	46	48	47	50	47	49	48	46	47	45	45	566	----------	566
Thrall-Minerva-Chapman	19	16	19	17	39	141	260	330	359	280	226	200	1,906	----------	1,906
Van	132	224	329	579	701	721	746	765	765	771	744	796	7,273	57	7,330
Other	8	8	9	10	10	12	12	12	8	8	7	8	112	−3	109
	2,322	2,260	2,531	2,798	3,273	3,511	3,952	4,087	3,982	4,097	3,630	3,706	40,149	296	40,445
North central Texas	4,068	3,797	4,120	4,190	4,292	4,034	3,897	3,679	3,258	3,221	2,951	2,663	44,170	131	44,301
Panhandle	2,492	2,445	2,647	2,963	3,161	3,021	3,023	3,056	2,457	2,565	2,130	1,865	31,825	−48	31,777
Southwest Texas	291	253	281	293	273	286	355	405	417	435	419	425	4,133	5	4,138
West Texas:															
Big Lake	501	455	505	490	504	511	615	660	656	741	734	678	7,050	----------	7,050
Chalk-Roberts [1]	1,198	1,091	1,264	1,264	1,177	927	906	783	795	1,049	875	600	11,929	70	11,999
Crane-Upton	1,315	1,276	1,424	1,305	1,332	1,148	1,215	1,182	1,070	1,116	1,079	1,034	14,496	−45	14,451
Ector	3	28	107	245	422	512	570	285	252	259	214	249	3,146	22	3,168
Fisher	36	35	27	28	46	53	55	61	59	54	43	35	532	----------	532
Hendricks	2,710	2,546	2,735	2,463	2,245	2,113	2,267	2,290	1,915	1,886	1,704	1,746	26,620	−216	26,404
Loving	35	33	39	34	41	52	54	51	64	80	83	94	660	3	663
Taylor-Link	128	189	167	146	123	112	108	102	91	82	73	71	1,392	−3	1,389
Ward	57	48	45	50	60	64	69	92	101	133	109	101	929	2	931
World	53	55	58	52	58	58	64	59	57	57	54	58	683	10	693
Yates	4,257	3,784	3,987	3,455	3,581	3,449	3,240	3,189	3,115	3,243	3,138	2,968	41,406	−68	41,338
Other	4	4	8	6	9	9	2	2	8	6	7	7	72	40	112
	10,297	9,544	10,366	9,538	9,598	9,008	9,165	8,756	8,183	8,706	8,113	7,641	108,915	−185	108,730
	19,470	18,299	19,945	19,782	20,597	19,860	20,392	19,983	18,297	19,024	17,243	16,300	229,192	199	229,391

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[1] Includes Westbrook.

Petroleum produced in coastal Texas salt-dome pools, 1930, by districts and months

[Thousands of barrels of 42 U. S. gallons]

District	Petroleum transported from producing properties													Oil consumed on leases plus net change in producers' stocks, Jan. 1-Dec. 31	Production
	January	February	March	April	May	June	July	August	September	October	November	December	The year		
Barbers Hill	637	628	776	654	601	581	558	534	509	619	624	706	7,427	14	7,441
Batson	36	35	38	34	38	36	34	33	33	32	31	34	414	4	418
Big Creek	157	102	92	103	132	128	128	125	101	119	102	98	1,387	3	1,390
Blue Ridge	57	49	55	54	59	55	49	52	59	54	45	49	637	7	644
Boling	33	28	34	37	31	31	35	36	29	29	26	27	376	2	378
Damon Mound	15	17	17	16	21	20	22	18	18	21	19	17	221	3	224
Dayton	42	30	23	20	22	66	47	27	36	27	27	30	397	9	406
Esperson	17	17	61	90	82	59	69	78	89	91	84	82	819	------	819
Fannette	50	32	37	33	33	31	24	24	21	20	20	18	343	7	350
Goose Creek	156	146	145	134	136	136	139	141	139	144	131	143	1,690	------	1,690
Hankamer	-----	-----	-----	34	52	87	71	72	49	48	62	68	543	3	546
High Island	40	29	25	42	40	29	19	17	18	15	17	17	308	23	331
Hull	300	245	263	262	305	272	242	264	256	232	238	236	3,115	13	3,128
Humble	431	430	581	511	473	415	551	640	540	495	396	376	5,839	20	5,859
Kingsville	5	4	4	3	4	2	3	3	5	2	4	2	41	------	41
Lost Lake	19	15	17	16	20	15	5	15	14	12	11	11	170	39	209
Markham	10	8	8	9	8	9	9	10	6	7	6	6	96	2	98
Moore	2	2	47	56	55	84	70	69	64	60	65	61	635	1	636
Orange	77	69	68	73	71	64	69	58	62	58	51	64	784	6	790
Pierce Junction	372	307	331	312	287	265	344	399	332	319	282	294	3,844	3	3,847
Port Neches	73	53	75	53	50	45	62	60	44	46	46	46	653	19	672
Raccoon Bend	336	322	317	305	360	340	363	364	364	288	261	277	3,897	−4	3,893
Refugio	767	1,067	1,193	1,139	1,140	1,123	1,025	853	821	779	765	791	11,463	22	11,485
Saratoga	26	32	30	31	26	31	30	33	36	35	29	28	367	13	380
Sourlake	69	67	67	70	72	66	67	69	63	64	57	66	797	9	806
South Liberty	201	164	145	134	134	125	116	106	99	93	88	82	1,487	16	1,503
Spindletop	624	503	505	510	542	541	559	527	491	494	444	439	6,179	−3	6,176
Sugarland	371	335	327	315	365	354	372	362	357	373	365	376	4,272	2	4,274
West Columbia [1]	181	172	181	171	163	160	169	123	123	125	138	142	1,848	89	1,937
Other [2]	30	55	51	53	52	51	44	54	87	90	41	45	653	42	695
	5,134	4,963	5,513	5,274	5,374	5,221	5,295	5,166	4,865	4,791	4,475	4,631	60,702	364	61,066

[1] Includes 110,000 barrels produced in Nash.

[2] Allen, Clay Creek, Corpus Christi, Moss Bluff, and Mykawa.

West Virginia.—In common with the other Eastern States in 1930 West Virginia showed a material decrease in oil wells completed and a general shifting of interest to gas developments. Production declined from 5,574,000 barrels in 1929 to 5,071,000 barrels in 1930—the lowest total since 1892. Although some good wells were completed in the State in 1930 no new fields or important extensions were opened up. On January 1, 1931, six refineries were operating in the State; these had a total daily charging capacity of 16,100 barrels and processed 3,921,000 barrels of crude petroleum in 1930, compared with 4,014,000 barrels in 1929. A small amount of crude was received from Kentucky in 1930, but the major movements were receipts of about 2,000,000 barrels from the Mid-Continent district (via Ohio) and the delivery of about 3,000,000 barrels to Pennsylvania.

Petroleum produced in West Virginia, 1926–1930, by months

[Thousands of barrels of 42 U. S. gallons]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The year
1926	449	440	497	493	490	510	518	504	518	519	489	519	5, 946
1927	475	474	550	509	518	517	496	523	505	507	484	465	6, 023
1928	460	460	502	451	519	471	481	489	444	506	444	434	5, 661
1929	458	403	466	465	492	452	482	477	453	511	454	461	5, 574
1930	462	443	449	471	475	451	444	355	372	417	350	382	5, 071

Wyoming.—Production in Wyoming again declined in 1930 when 17,868,000 barrels was produced, a decrease of approximately 1,500,000 barrels from 1929. This drop in production was due largely to the decline at Salt Creek, the largest field in the State. The Salt Creek field yielded 10,531,000 barrels (including 11,000 barrels from East Teapot) in 1930, compared with 11,377,000 barrels in 1929; however, since its discovery the field has produced more than 225,000,000 barrels from an area of less than 22,000 acres. Salt Creek had its first deep test in 1930 before entering granite at 5,420 feet; this well struck a number of oil-bearing formations, the most important of which was in the Tensleep sand. Production in the majority of the other fields of Wyoming declined in 1930; the most notable exception was the Osage field, Weston County. Although this field has produced oil since 1920, its output in 1930 was more than double that in any previous year.

In all, 100 oil wells were completed in Wyoming in 1930 compared with 82 in 1929; however, these completions were much lower in daily average initial yield. Prospecting, particularly in the deeper sands, also showed a gain. The important discoveries were the finding of oil in the Midway and Badger Basin structures and in the deeper sands at Osage, Lance Creek, Lost Soldier, Mahoney Dome, and Byron. The discoveries on the Midway and Badger Domes were particularly interesting, the first because it occurred on a dome which had been known to exist for years and the second because it established a record for cable-tool drilling at 8,250 feet. The majority of the deep discoveries were found in the Tensleep sand of Pennsylvanian age. The oil was almost uniformly lower in grade than that found in the shallower formations, and the economic importance of the new discoveries was thereby considerably reduced.

There are about a dozen operating refineries in Wyoming; most of them are small skimming plants, but one at Casper is the largest refinery west of the Mississippi (exclusive of California and the Gulf coast). Wyoming is practically self-sustaining as to crude requirements. Runs to stills amounted to 14,645,000 barrels in 1930, compared with 18,881,000 barrels in 1929. The difference of approximately 3,000,000 barrels between production and consumption at refineries consists of shipments to Utah and Montana, exports to Canada, consumption as fuel, and additions to storage.

Petroleum produced in Wyoming, 1921–1930, by districts

[Thousands of barrels of 42 U. S. gallons]

Year	Big Muddy	Byron-Greybull-Torchlight	Elk Basin	Ferris	Grass Creek	Hamilton Dome-Warm Springs	La Barge	Lance Creek	Lander-Dallas-Derby Dome	Lost Soldier	Mule Creek
1921	1,927	80	681	(1)	1,435	67	--------	346	119	[1] 524	68
1922	1,506	70	652	(1)	1,784	111	--------	282	149	[1] 751	168
1923	1,527	57	634	(1)	1,589	216	--------	363	137	[1] 1,551	-------
1924	1,272	33	409	42	1,113	239	--------	786	133	1,733	178
1925	1,223	30	314	33	1,240	264	--------	360	152	1,713	129
1926	1,215	(2)	273	(1)	1,025	319	70	540	165	[1] 2,059	-------
1927	1,072	28	337	(1)	974	313	341	269	246	[1] 1,341	188
1928	962	25	360	(1)	871	298	490	217	247	[1] 1,442	142
1929	802	26	265	(1)	778	355	805	87	209	[1] 1,311	141
1930	711	49	264	(1)	729	300	747	60	252	[3] 1,271	29

Year	Notches	Oregon Basin	Osage	Pilot Butte	Poison Spider-South Casper	Rex Lake	Rock Creek	Salt Creek	Teapot	Other	Total
1921	--------	--------	176	46	--------	--------	1,681	12,172	--------	11	19,333
1922	--------	--------	182	38	--------	--------	1,728	19,248	37	9	26,715
1923	61	--------	178	29	(2)	--------	1,429	35,770	1,156	88	44,785
1924	39	--------	146	29	229	41	1,181	30,874	1,004	17	39,498
1925	35	--------	109	25	297	20	1,087	21,445	632	65	29,173
1926	34	--------	113	20	[4] 376	53	1,029	18,010	426	49	25,776
1927	24	--------	107	17	247	44	982	14,399	314	64	21,307
1928	--------	882	133	19	327	18	928	14,023	--------	77	21,461
1929	--------	1,540	166	18	[5] 446	36	842	11,377	--------	110	19,314
1930	--------	1,285	385	16	[5] 323	6	770	[6] 10,531	--------	[7] 140	17,868

[1] Ferris included with Lost Soldier.
[2] Included under "Other."
[3] Includes Ferris and Tensleep.
[4] Includes Iron Creek and Simpson Ridge.
[5] Includes Simpson Ridge.
[6] Includes 11,000 barrels from East Teapot Dome.
[7] Includes Frannie and other fields.

Petroleum produced in Wyoming, 1930, by districts and months

[Thousands of barrels of 42 U. S. gallons]

District	Petroleum transported from producing properties													Oil consumed on leases plus net change in producers' stocks, Jan. 1-Dec. 31	Production
	January	February	March	April	May	June	July	August	September	October	November	December	The year		
Big Muddy	56	58	62	60	63	58	62	59	60	59	56	59	712	−1	711
Elk Basin	20	20	21	23	24	24	24	22	23	23	21	20	265	−1	264
Grass Creek	56	55	61	63	63	63	62	62	62	64	57	64	732	−3	729
Hamilton Dome-Warm Springs	24	18	20	41	26	33	28	40	22	34	14	-----	300	------	300
La Barge	70	64	71	65	64	62	63	62	57	56	53	56	743	4	747
Lance Creek	5	5	6	4	4	4	4	4	4	5	7	9	61	−1	60
Lander-Dallas	15	16	20	24	19	17	16	21	20	21	29	25	243	9	252
Lost Soldier-Ferris-Tensleep	99	93	94	94	100	34	35	109	153	159	127	141	1,238	33	1,271
Oregon Basin	121	114	162	143	149	129	89	78	77	81	88	60	1,291	−6	1,285
Osage	13	16	21	18	23	25	36	45	42	49	50	47	385	------	385
Poison Spider-South Casper	33	20	21	20	29	28	36	49	38	30	16	3	323	------	323
Rex Lake	3	2	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	6	------	6
Rock Creek	67	62	66	64	65	64	67	65	65	63	61	64	773	−3	770
Salt Creek [1]	846	871	949	926	914	873	884	852	870	882	810	869	10,546	−15	10,531
Other [2]	20	3	17	13	32	8	9	24	23	27	26	14	216	18	234
	1,448	1,417	1,592	1,558	1,575	1,422	1,415	1,492	1,516	1,553	1,415	1,431	17,834	34	17,868

[1] Includes 11,000 barrels from East Teapot Dome.
[2] Includes Frannie and other fields.

WORLD PRODUCTION

The world production of petroleum during 1930 reached a total of 1,410,037,000 barrels, a decrease of 75,830,000 barrels (5.1 per cent) from 1929. This decline was due mainly to the decrease in output in the United States; in fact, production in nearly all the other countries either remained stationary or showed a material increase. The proportion of production in the United States to that of the world decreased from 67.8 per cent in 1929 to 63.7 per cent in 1930. The percentage of the world total produced by the United States has undergone some interesting changes. In the early days of the industry—that is, about 1860—the percentage was close to 100; it then declined gradually, until the low point of 41 was reached in 1901. At that time Russia was the leading producing nation, and oil had just been discovered in Mexico. The period 1901 to 1921 marked an increase in the relative importance of the United States and Mexico, with a material decrease of production in Russia. (See fig. 56.) In recent years the output in Mexico has shown a consistent decline, but that in Russia and other countries has increased. Since the beginning of commercial production the United States has produced 66 per cent of the world output.

Production in Venezuela showed a small decline in 1930 and that in Russia a material increase; however, the former continued to hold second place among the producing nations, with Russia in third place, far ahead of Persia, the next in rank. Production in Rumania registered a substantial increase in 1930; this marked the eleventh successive increase of annual output in that country. Among the smaller producing countries, Germany made the most marked advance; its production exceeded a million barrels for the first time in the post-war period. Bolivia was added to the list of producing countries in 1930.

Venezuela.—Production in Venezuela declined from 137,472,000 barrels in 1929 to 136,669,000 barrels in 1930, but the country retained second place among the crude-producing nations. This decrease, the first since the beginning of commercial production in 1917, was due chiefly to curtailment by the comparatively few large operators that operate in the Maracaibo Basin. Production at Lagunillas, the largest field, showed a small increase in 1930. Material gains in output were recorded in the Mene Grande and Tarra fields, but these were more than balanced by decreases in the La Rosa-Ambrosio district.

Russia.—Production in every district in Russia increased, and the total output rose to 125,555,000 barrels from 99,507,000 barrels in 1929. On the basis of quantity, this is the largest increase reported by any nation in 1930. Production at Baku, the leading producing district, rose from 63,129,000 barrels in 1929 to 74,060,000 barrels in 1930; that in the Grozny field increased from 33,094,000 barrels to 45,328,000 barrels in the same period. Although these gains were large, the relative importance of the smaller fields increased.

Persia.—Production in Persia totaled 45,828,000 barrels, a new record and an increase of 8.7 per cent over that in 1929. Persia rose from fifth to fourth place among the nations.

Netherland East Indies.—Production in Netherland East Indies increased 6.2 per cent, largely as the result of increased operations in the Palembang field of Sumatra. The Netherland East Indies rose from sixth to fifth place among the producing nations.

Rumania.—Production in Rumania, as in Russia, Persia, and Netherland East Indies, rose to a new peak in 1930. The total production was 41,624,000 barrels, compared with 34,758,000 barrels in 1929. This material gain resulted almost entirely from increased production in the Prahova district.

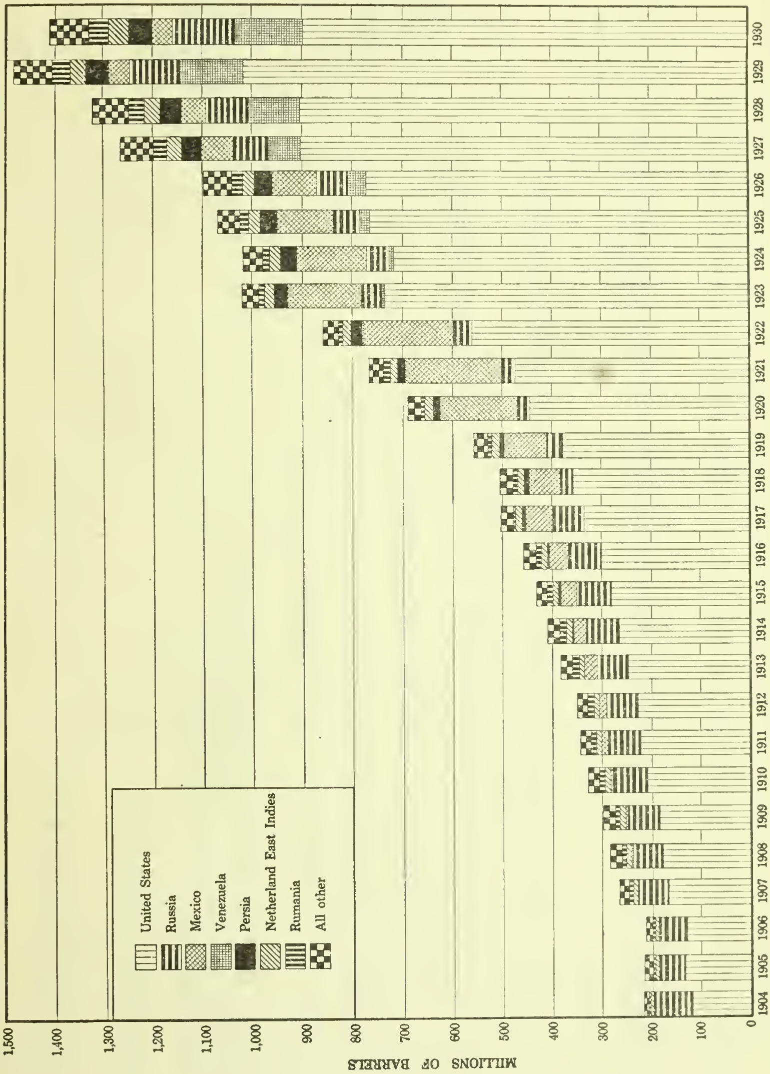

FIGURE 56.—World production of crude petroleum, 1904-1930, by countries

Mexico.—Outside of the United States, Mexico was the only important producing nation in which output declined in 1930; in consequence, it dropped from fourth to seventh position among the producing countries. As in the past few years, the major portion of the decline in Mexico occurred in the heavy-oil fields, such as Pánuco and Ebano.

World production of crude petroleum,

[Thousands of barrels

Year	Rumania	United States	Italy	Canada	Russia [1]	Poland (Galicia)	Japan and Taiwan	Germany	India	Netherland East Indies	Peru	Mexico	Argentina
1857-60	19	502	(3)	------	------	------	------	------	------	------	------	------	------
1861	17	2,114	(3)	------	------	------	------	------	------	------	------	------	------
1862	23	3,057	(3)	12	------	------	------	------	------	------	------	------	------
1863	28	2,611	(3)	83	41	------	------	------	------	------	------	------	------
1864	33	2,116	(3)	90	65	------	------	------	------	------	------	------	------
1865	39	2,498	2	110	67	------	------	------	------	------	------	------	------
1866	42	3,598	1	175	83	------	------	------	------	------	------	------	------
1867	51	3,347	1	190	120	------	------	------	------	------	------	------	------
1868	56	3,646	(3)	200	88	------	------	------	------	------	------	------	------
1869	59	4,215	(3)	220	202	------	------	------	------	------	------	------	------
1870	84	5,261	(3)	250	204	------	------	------	------	------	------	------	------
1871	90	5,205	(3)	270	165	------	------	------	------	------	------	------	------
1872	91	6,293	(3)	308	185	------	------	------	------	------	------	------	------
1873	104	9,894	(3)	365	475	------	------	------	------	------	------	------	------
1874	103	10,927	1	169	583	150	------	------	------	------	------	------	------
1875	108	8,788	1	220	697	158	5	------	------	------	------	------	------
1876	111	9,133	3	312	1,321	164	7	------	------	------	------	------	------
1877	108	13,350	3	312	1,801	170	10	------	------	------	------	------	------
1878	109	15,397	4	312	2,401	176	18	------	------	------	------	------	------
1879	110	19,914	3	575	2,761	215	23	------	------	------	------	------	------
1880	115	26,286	2	350	3,001	229	26	9	------	------	------	------	------
1881	122	27,661	1	275	3,601	287	17	29	------	------	------	------	------
1882	136	30,350	2	275	4,538	330	15	58	------	------	------	------	------
1883	139	23,450	2	250	6,002	365	20	27	------	------	------	------	------
1884	211	24,218	3	250	10,805	408	28	46	------	------	------	------	------
1885	193	21,859	2	250	13,925	465	30	41	------	------	------	------	------
1886	168	28,065	2	584	18,006	306	38	74	------	------	------	------	------
1887	182	28,283	1	526	18,368	344	29	74	------	------	------	------	------
1888	219	27,612	1	695	23,049	467	37	85	------	------	------	------	------
1889	298	35,164	1	705	24,609	515	53	68	94	------	------	------	------
1890	383	45,824	3	795	28,691	659	52	108	118	------	------	------	------
1891	488	54,293	8	755	34,573	631	53	109	190	------	------	------	------
1892	593	50,515	18	780	35,775	646	69	101	242	------	------	------	------
1893	535	48,431	19	798	40,457	693	106	100	299	600	------	------	------
1894	508	49,344	21	829	36,375	949	173	123	327	688	------	------	------
1895	576	52,892	26	726	46,140	1,453	170	121	372	1,216	------	------	------
1896	543	60,960	18	727	47,221	2,444	237	145	430	1,427	47	------	------
1897	571	60,476	14	710	54,399	2,226	262	166	546	2,552	71	------	------
1898	776	55,364	15	758	61,610	2,376	319	184	542	2,964	71	------	------
1899	1,426	57,071	16	808	65,955	2,314	539	192	941	1,796	89	------	------
1900	1,629	63,621	12	913	75,780	2,347	871	358	1,079	2,253	274	------	------
1901	1,678	69,389	16	757	85,168	3,251	1,117	314	1,431	4,014	275	10	------
1902	2,060	88,767	19	531	80,540	4,142	996	354	1,617	2,430	287	40	------
1903	2,763	100,461	18	487	75,591	5,235	1,209	446	2,510	5,770	278	75	------
1904	3,599	117,081	26	553	78,537	5,947	1,219	637	3,385	6,508	290	126	------
1905	4,421	134,717	44	634	54,960	5,766	1,347	561	4,137	7,850	373	251	------
1906	6,378	126,494	54	569	58,897	5,468	1,564	579	4,016	8,181	531	502	------
1907	8,118	166,095	60	789	61,851	8,456	1,718	757	4,344	9,983	751	1,005	(3)
1908	8,252	178,527	51	528	62,187	12,612	1,871	1,009	5,047	10,283	945	3,933	12
1909	9,327	183,171	42	421	65,970	14,933	1,887	1,019	6,677	11,042	1,411	2,714	18
1910	9,724	209,557	51	316	70,337	12,673	1,829	1,032	6,138	11,031	1,258	3,634	20
1911	11,108	220,449	75	291	66,184	10,519	1,737	1,017	6,451	12,173	1,465	12,553	13
1912	12,976	222,935	54	243	68,019	8,535	1,659	1,031	7,117	10,846	1,752	16,558	47
1913	13,555	248,446	47	228	62,834	7,818	1,940	857	7,930	11,172	2,071	25,696	131
1914	12,827	265,763	40	215	67,020	6,436	2,636	781	7,410	11,422	1,837	26,235	276
1915	12,030	281,104	44	215	68,548	5,352	2,928	703	8,202	11,920	2,579	32,911	513
1916	8,945	300,767	51	198	65,817	6,587	2,963	656	8,491	12,547	2,593	40,546	867
1917	3,721	335,316	41	214	63,072	6,228	2,861	642	8,079	13,180	2,577	55,293	1,218
1918	8,730	355,928	35	305	27,168	6,032	2,441	270	8,188	12,778	2,527	63,828	1,353
1919	6,618	378,367	35	241	31,752	6,096	2,238	265	8,736	15,508	2,628	87,073	1,331
1920	7,435	442,929	35	196	25,430	5,607	2,221	246	8,375	17,529	2,817	157,069	1,651
1921	8,368	472,183	32	188	28,968	5,167	2,233	274	8,734	16,958	3,699	193,398	2,036
1922	9,843	557,531	31	179	35,692	5,227	2,055	319	8,529	17,066	5,314	182,278	2,866
1923	10,867	732,407	34	170	39,147	5,402	1,804	346	8,406	19,870	5,699	149,585	3,400
1924	13,369	713,940	39	161	45,355	5,657	1,814	406	8,416	20,473	8,379	139,678	4,639
1925	16,650	763,743	61	332	52,448	5,960	1,915	541	8,274	21,422	9,232	115,515	6,336
1926	23,314	770,874	41	364	64,311	5,844	1,785	653	8,011	21,243	10,762	90,421	7,851
1927	26,368	901,129	47	477	77,018	5,342	1,789	663	8,032	27,459	10,127	64,121	8,630
1928	30,773	901,474	46	624	[5] 84,745	5,492	1,944	630	8,741	32,118	12,006	50,151	9,070
1929	34,758	1,007,323	45	1,117	[5] 99,507	4,988	2,023	704	8,747	39,279	13,422	44,688	9,391
1930	41,624	898,011	59	1,522	[5] 125,555	4,904	1,950	1,182	8,292	41,729	12,449	39,530	9,002
	381,395	13,148,483	1,479	29,997	2,556,767	223,163	60,900	21,112	207,643	477,280	120,886	1,599,417	70,671

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[1] Exclusive of Sakhalin, which is shown separately.

[2] Estimated.

[3] Less than 1,000 barrels.

1857–1930, by years and countries

of 42 U. S. gallons]

Trinidad	Egypt	Persia	Sarawak	Algeria	Ecuador	Venezuela	France	England	Czechoslovakia	Sakhalin (Russian)	Colombia	Iraq	Bolivia	Other countries [2]	Total	Percentage produced by United States
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	521	96
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	2,131	99
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	3,092	99
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	2,763	94
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	2,304	92
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	2,716	92
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	3,899	92
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	3,709	90
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	3,990	91
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	4,696	90
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	5,799	91
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	5,730	91
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	6,877	92
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	10,838	91
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	11,933	92
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	9,977	88
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	11,051	83
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	15,754	85
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	18,417	84
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	23,601	84
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	30,018	88
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	31,993	86
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	35,704	85
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	30,255	78
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	35,969	67
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	36,765	59
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	47,243	59
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	47,807	59
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	52,165	53
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	61,507	57
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	76,633	60
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	91,100	60
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	88,739	57
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	92,038	53
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	89,337	55
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	103,692	51
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	114,199	53
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	121,993	50
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	124,979	44
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	131,147	44
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	149,137	43
----	----	----	----	----	----	----	----	----	----	----	----	----	----	20	167,440	41
----	----	----	----	----	----	----	----	----	----	----	----	----	----	26	181,809	49
----	----	----	----	----	----	----	----	----	----	----	----	----	----	36	194,879	52
----	----	----	----	----	----	----	----	----	----	----	----	----	----	40	217,948	54
----	----	----	----	----	----	----	----	----	----	----	----	----	----	30	215,091	63
----	----	----	----	----	----	----	----	----	----	----	----	----	----	30	213,263	59
----	----	----	----	----	----	----	----	----	----	----	----	----	----	30	263,957	63
(3)	----	----	----	----	----	----	----	----	----	----	----	----	----	30	285,287	63
57	----	----	----	----	----	----	----	----	----	----	----	----	----	20	298,709	61
143	----	----	----	----	----	----	----	----	----	----	----	----	----	20	327,763	64
285	21	----	----	----	----	----	----	----	----	----	----	----	----	20	344,361	64
437	214	----	----	----	----	----	----	----	----	----	----	----	----	20	352,443	63
504	98	1,857	141	----	----	----	----	----	----	----	----	----	----	20	385,345	64
644	753	2,910	318	1	----	----	----	----	----	----	----	----	----	20	407,544	65
750	212	3,616	392	4	----	----	----	----	----	----	----	----	----	10	432,033	65
929	404	4,477	629	8	----	----	----	----	----	----	----	----	----	25	457,500	66
1,602	943	7,147	542	9	57	120	----	----	----	----	----	----	----	29	502,891	67
2,082	1,935	8,623	504	7	[2] 60	333	[4] 363	----	----	----	----	----	----	25	503,515	71
1,841	1,517	10,139	596	5	[2] 60	425	334	2	48	----	----	----	----	20	555,875	68
2,083	1,042	12,230	1,020	4	[2] 60	457	356	3	69	----	----	----	----	20	688,884	64
2,354	1,255	16,673	1,411	3	[2] 60	1,433	389	3	94	2	67	----	----	20	766,002	62
2,445	1,188	22,247	2,849	9	[2] 60	2,201	496	1	120	7	323	----	----	22	858,898	65
3,051	1,054	25,230	3,940	9	87	4,201	494	1	74	9	425	----	----	24	1,015,736	72
4,057	1,122	32,373	4,163	11	[2] 100	9,042	497	2	76	80	445	----	----	24	1,014,318	70
4,387	1,226	35,038	4,257	12	160	19,687	459	3	158	87	1,007	----	----	23	1,068,933	71
4,971	1,188	35,842	4,942	9	214	36,911	478	2	150	181	6,444	----	----	17	1,096,823	70
5,380	1,267	39,688	4,943	8	537	63,134	504	2	112	440	15,014	338	----	13	1,262,582	71
7,684	1,842	43,461	[6] 5,223	8	1,084	105,749	512	1	94	677	19,897	713	----	15	1,324,774	68
8,716	1,868	42,145	[6] 5,290	20	1,381	137,472	535	----	93	[5] 1,134	20,385	798	(3)	38	1,485,867	68
9,419	1,996	45,828	[6] 4,907	16	1,553	136,669	523	(3)	157	[5] 1,805	20,346	913	56	40	1,410,037	64
63,821	21,145	389,524	46,067	143	5,473	517,834	5,940	20	1,245	4.422	84.353	2,762	56	727	20,042,725	66

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[4] Production in previous years credited to Germany.

[5] Year ended Sept. 30.

[6] Includes a small production from Brunei.

World production of petroleum in 1930, by countries, compared with 1929

[Compiled by L. M. Jones, of the Bureau of Mines]

Country	1930			1929		
	Thousands of barrels of 42 U. S. gallons [1]	Thousands of metric tons	Percentage of total by volume	Thousands of barrels of 42 U. S. gallons [1]	Thousands of metric tons	Percentage of total by volume
United States	898,011	123,117	63.7	1,007,323	138,104	67.8
Venezuela	136,669	20,252	9.7	137,472	20,402	9.3
Russia [2] [3]	125,555	17,221	8.9	99,507	13,659	6.7
Persia	45,828	6,034	3.3	42,145	5,549	2.8
Netherland East Indies	41,729	5,532	3.0	39,279	5,239	2.7
Rumania	41,624	5,792	3.0	34,758	4,837	2.3
Mexico	39,530	5,914	2.8	44,688	6,700	3.0
Colombia	20,346	2,905	1.4	20,385	2,911	1.4
Peru	12,449	1,656	.9	13,422	1,777	.9
Trinidad	9,419	1,315	.7	8,716	1,217	.6
Argentina	9,002	1,301	.6	9,391	1,365	.6
India, British	8,292	1,164	.6	8,747	1,228	.6
British Borneo (Sarawak) [4]	4,907	707	.4	5,290	762	.4
Poland	4,904	663	.3	4,988	675	.3
Egypt	1,996	285	.1	1,868	272	.1
Japan (including Taiwan)	1,950	271	.1	2,023	281	.1
Sakhalin, Russian [3]	1,805	267	.1	1,134	168	.1
Ecuador	1,553	221	.1	1,381	196	.1
Canada	1,522	186	.3	1,117	137	.2
Germany	1,182	173		704	103	
Iraq	913	122		798	116	
France	523	76		535	77	
Czechoslovakia	157	23		93	14	
Italy	59	8		45	6	
Bolivia	56	7		(5)	(5)	
Algeria	16	8		20	9	
Other countries [6]	40			38		
	1,410,037	195,220	100.0	1,485,867	205,804	100.0

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[1] One cubic meter of petroleum equals 6.29 barrels of 42 U. S. gallons.
[2] Exclusive of Sakhalin, which is shown separately.
[3] Year ended Sept. 30.
[4] Includes a small production from Brunei.
[5] Included under "Other countries."
[6] Estimated in part.

PRODUCTION OF PETROLEUM IN FOREIGN COUNTRIES IN 1930, BY FIELDS

Petroleum produced in certain foreign countries in 1930, by provinces, districts, or fields

[Compiled by L. M. Jones, of the Bureau of Mines]

	Barrels of 42 U. S. gallons	Metric tons
Argentina:		
Comodoro Rivadavia	7,357,451	1,082,281
Plaza Huincul	1,346,167	182,406
Other fields	297,957	36,706
	9,001,575	1,301,393
Canada:		
Alberta	1,398,160	168,758
New Brunswick	6,758	898
Ontario—		
Bothwell	21,176	2,895
Oil Springs	29,160	3,913
Petrolia and Enniskillen	55,130	7,680
Other fields	11,836	1,618
	117,302	16,106
	1,522,220	185,762
Colombia: Infantas	20,345,916	2,905,397

	Barrels of 42 U. S gallons	Metric tons
Ecuador: Santa Elena	1,553,367	220,578
Egypt:		
Abu-Durbar	3,434	531
Hurghada	1,992,468	284,557
	1,995,902	285,088
France:		
Alsace—Pechelbronn	509,040	73,806
Hérault—Gabian	14,042	1,880
	523,082	75,686
Germany:		
Hildesheim	169,920	24,824
Lüneburg	990,766	144,743
Other fields	21,726	3,174
	1,182,412	172,741

Petroleum produced in certain foreign countries in 1930, by provinces, districts, or fields—Continued

	Barrels of 42 U. S. gallons	Metric tons
Iraq:		
Baba-Gurgur	307,000	41,000
Naft Khana	606,000	81,000
	913,000	122,000
Italy:		
Abruzzi—Pescara	78	12
Emilia—		
Parma	30,460	3,961
Piacenza	21,002	2,598
Rome—Frosinone	7,928	1,220
	59,468	7,791
Mexico:		
Heavy oil—		
Altamira	16,665,069	2,603,084
Ebano		
El Limón		
Pánuco—		
Cacalilao		
Other		
San Jerónimo		
Topila		
	16,665,069	2,603,084
Light oil—		
Alazán	22,864,839	3,310,829
Belén		
Cerro Viejo		
Chiconcillo and San Miguel		
Dos Bocas		
Filisola		
Furbero		
Jardín and Paso Real		
Mecatepec		
Potrero del Llano		
San Isidro		
Sarlat		
Tangüijo		
Teapa		
Tecuanapa		
Tepetate, Chinampa, Amatlán, and Zacamixtle		
Tierra Amarilla		
Tierra Blanca, Chapapote, and Alamo		
Tonalá		
Toteco and Cerro Azul		
	22,864,839	3,310,829
	39,529,908	5,913,913
Netherland East Indies:		
Borneo	18,966,225	2,626,992
Ceram	355,867	47,411
Java—		
Central Java	3,114,865	405,054
East Java	1,482,925	196,466
	4,597,790	601,520
Netherland East Indies—Continued.		
Sumatra—		
Atjeh	2,968,906	372,090
Djambi	1,471,348	186,743
East coast	1,293,535	164,175
Palembang	12,075,450	1,532,612
	17,809,239	2,255,620
	41,729,121	5,531,543
Peru:		
La Brea and Pariñas	9,766,921	1,299,113
Lobitos	1,191,053	159,079
Restín and Alto	1,436,935	190,306
Zorritos	53,979	7,085
	12,448,888	1,655,583
Poland:		
Drohobycz	3,913,808	529,537
Jaslo	632,492	85,276
Stanislaw	357,813	48,517
	4,904,113	663,330
Rumania:		
Bacau	468,168	65,150
Buzau	439,963	61,225
Dambovitza	9,990,085	1,390,215
Prahova	30,725,331	4,275,721
	41,623,547	5,792,311
Russia:[1]		
Baku	74,060,327	10,283,300
Cheleken Island (Turkmenistan)	77,022	11,000
Emba-Ural	2,477,448	342,000
Ferghana (Uzbekistan)	273,078	39,000
Grozny	45,328,343	6,077,000
Kuban-Black Sea	3,296,524	462,800
Ural	42,738	6,000
	125,555,480	17,221,100
Sakhalin: Okha [2]	1,804,950	267,400
Venezuela:		
Falcón—		
El Mene de Acosta	260,554	34,046
El Mene Mauroa	1,928,633	252,010
Urumaco	93,149	12,603
	2,282,336	298,659
Monagas—Quiriquire	1,193,162	187,870
Sucre—Guanoco	253,138	39,858
Zulia—		
Concepción	3,246,075	439,193
Distrito Mara	830	123
Lagunillas [3]	80,747,719	12,160,801
La Paz	370,396	52,117
La Rosa and Ambrosio [3]	22,903,331	3,364,179
Mene Grande	20,599,245	3,007,189
Tarra	5,031,722	696,143
Totumo	40,967	6,071
	132,940,285	19,725,816
	136,668,921	20,252,203

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[1] Exclusive of Sakhalín, which is shown separately.
[2] Year ended Sept. 30.
[3] Some production from La Rosa is included under Lagunillas.

IMPORTS AND EXPORTS

Imports fell from 78,933,000 barrels in 1929 to 62,129,000 barrels in 1930, the largest decrease since 1923. The 1930 imports were valued at $1.04 per barrel which, although 15 cents below the average value of domestic production, represents a slight gain over 1929, as compared with a drop in the average for domestic crudes. It should be noted, however, that the average value of foreign crude includes transportation charges, whereas that for domestic crude is "at the well." Practically all the decline in total imports in 1930 was recorded in receipts of crude from Venezuela; however, that country continued to be the chief source of supply for the foreign crude used in the United States. Imports from Mexico continued to decline in 1930, but those from Colombia again increased. The refiners along the Atlantic seaboard continued to take the major portion of the crude imported; in 1930 they refined 57,033,000 barrels of foreign crude, compared with 3,799,000 barrels handled at refineries in the remainder of the country.

Exports of crude petroleum from the United States, including a few thousand barrels shipped to the noncontiguous Territories, amounted to 23,705,000 barrels in 1930, compared with 26,401,000 barrels in 1929.

Canada continued to be the leading destination for exports of crude oil, with Japan second. Crude oil moves from the United States to Canada in a number of ways. The most important route is by pipe lines in the vicinity of the Great Lakes; the other movements are by water from California to the Vancouver district, by pipe lines and tank cars across the Montana and Dakota borders, and by water from the Gulf up the coast and down the St. Lawrence. Exports to Germany increased from practically nothing in 1929 to 755,000 barrels in 1930.

Crude petroleum imported, exported, and shipped to Territories, 1926–1930

[Barrels of 42 U. S. gallons]

Year	Imports		Exports (including foreign crude oil)		Shipments from United States to Territories				Total of exports and shipments to Territories
					Alaska		Hawaii		
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value	Barrels
1926	60, 382, 329	$79, 307, 877	15, 407, 398	$28, 500, 209	496	$2, 743	------	------	15, 407, 894
1927	58, 382, 632	78, 609, 117	15, 843, 646	25, 944, 822	------	------	------	------	15, 843, 646
1928	79, 766, 672	90, 473, 284	18, 962, 357	26, 787, 866	270	1, 077	3, 339	$3, 005	18, 965, 966
1929	78, 932, 572	79, 943, 429	26, 394, 358	37, 799, 706	2, 135	2, 145	5, 005	5, 259	26, 401, 498
1930	62, 129, 419	64, 872, 121	23, 704, 162	32, 153, 377	------	------	727	1, 393	23, 704, 889

Crude petroleum imported and exported, 1930, by months

[Thousands of barrels of 42 U. S. gallons]

	January	February	March	April	May	June	July	August	September	October	November	December	The year	
													Thousands of barrels	Value (thousands of dollars)
Imports:														
By countries—														
Colombia	1, 181	937	1, 380	1, 520	1, 002	1, 144	987	1, 176	1, 449	1, 190	1, 098	1, 140	14, 204	19, 860
Mexico	435	418	489	630	817	1, 190	1, 246	1, 271	995	1, 043	887	672	10, 093	8, 232
Peru	166	212	-----	-----	332	-----	-----	166	100	140	-----	165	1, 281	2, 878
Venezuela [1]	3, 606	2, 706	2, 897	3, 413	2, 724	3, 322	3, 531	2, 332	3, 139	2, 458	2, 371	2, 581	35, 080	31, 961
Other countries	62	48	61	218	109	111	113	114	125	230	111	169	1, 471	1, 941
	5, 450	4, 321	4, 827	5, 781	4, 984	5, 767	5, 877	5, 059	5, 808	5, 061	4, 467	4, 727	62, 129	64, 872
By ports of entry—														
Atlantic coast	5, 196	4, 075	4, 531	5, 586	4, 748	5, 537	5, 436	4, 623	5, 667	4, 601	4, 398	4, 365	58, 763	62, 335
Gulf coast	254	246	296	195	236	229	437	431	127	459	69	362	3, 341	2, 497
Northern border	-----	-----	-----	-----	(2)	1	4	5	14	1	-----	-----	25	40
	5, 450	4, 321	4, 827	5, 781	4, 984	5, 767	5, 877	5, 059	5, 808	5, 061	4, 467	4, 727	62, 129	64, 872
Exports:														
By countries—														
Domestic crude oil—														
Canada	1, 289	1, 438	1, 379	1, 429	1, 809	2, 073	1, 643	1, 935	1, 722	1, 675	1, 443	1, 132	18, 967	25, 689
Cuba	53	53	54	54	53	56	-----	53	56	80	-----	-----	512	1, 020
Germany	11	122	(2)	-----	162	118	-----	208	-----	134	(2)	-----	755	1, 491
Japan	377	60	462	308	175	254	260	159	129	224	320	198	2, 926	3, 223
Mexico	2	1	3	2	1	2	1	1	3	2	2	4	24	28
Spain	46	-----	-----	49	-----	-----	-----	50	-----	-----	-----	-----	145	205
United Kingdom	-----	57	-----	58	-----	-----	-----	-----	50	-----	-----	-----	165	158
Other countries	30	(2)	46	(2)	2	4	69	1	1	52	-----	5	210	339
	1, 808	1, 731	1, 944	1, 900	2, 202	2, 507	1, 973	2, 407	1, 961	2, 167	1, 765	1, 339	23, 704	32, 153
By ports														
Atlantic coast	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	1	(2)	(2)	1	6
Gulf coast	141	152	57	163	186	324	275	378	246	377	132	9	2, 440	3, 848
Northern border	915	976	1, 014	920	1, 263	1, 434	1, 121	1, 297	1, 261	1, 197	710	783	12, 891	19, 371
Pacific coast	752	603	873	817	753	749	577	732	454	592	923	547	8, 372	8, 928
	1, 808	1, 731	1, 944	1, 900	2, 202	2, 507	1, 973	2, 407	1, 961	2, 167	1, 765	1, 339	23, 704	32, 153
Excess of imports over exports	3, 642	2, 590	2, 883	3, 881	2, 782	3, 260	3, 904	2, 652	3, 847	2, 894	2, 702	3, 388	38, 425	32, 719

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[1] Includes imports recorded by Bureau of Foreign and Domestic Commerce as from Netherland West Indies.

[2] Less than 500 barrels.

SHIPMENTS FROM CALIFORNIA THROUGH THE PANAMA CANAL

Shipments of crude oil from California through the Panama Canal to Atlantic and Gulf ports of the United States, of considerable magnitude in 1923 and 1924, ceased in 1930. Shipments of gasoline, naphtha, and natural gasoline also declined and amounted to 20,186,000 barrels in 1930, compared with 23,483,000 barrels in 1929. This decline reflected the increased competition of gasoline shipped to the Atlantic seaboard from the Gulf. Gas oil was second to gasoline in importance, shipments of the former increasing from 3,724,000 barrels in 1929 to 4,141,000 barrels in 1930. This gas oil is used principally as a cracking stock. Despite the fact that prices of fuel oil continued at a low level on the Pacific coast, shipments of fuel oil from California to eastern ports showed no tendency to increase and amounted to only 38,000 barrels in 1930, compared with 179,000 barrels in 1929. Shipments of other refined products—namely, kerosene, Diesel oil, lubricants, and asphalt—continued to be relatively unimportant.

California oil shipped through the Panama Canal to Atlantic and Gulf ports in the United States, 1930, by months [1]

[Thousands of barrels of 42 U. S. gallons]

	January	February	March	April	May	June	July	August	September	October	November	December	The year
Gasoline, naphtha, etc	1,448	1,512	943	1,375	1,343	2,405	2,163	1,762	1,634	1,433	1,179	1,276	18,473
Natural gasoline	221	73	130	129	89	144	71	72	72	342	144	226	1,713
Kerosene	50	49	-----	-----	-----	81	-----	-----	-----	-----	18	80	278
Gas oil	320	451	243	309	333	65	524	157	272	605	520	342	4,141
Diesel oil	-----	65	79	-----	-----	64	-----	-----	-----	-----	-----	-----	208
Fuel oil	3	4	3	3	3	4	3	2	2	3	5	3	38
Lubricants	-----	29	30	2	37	1	8	4	1	4	12	3	131
Asphalt	2	3	2	1	2	1	1	1	2	2	2	1	20
	2,044	2,186	1,430	1,819	1,807	2,765	2,770	1,998	1,983	2,389	1,880	1,931	25,002

[1] Compiled by E. T. Knudsen, of the San Francisco office of the Bureau of Mines.

STOCKS

Beginning with 1930, the statistical procedure followed by the bureau with reference to stocks of crude petroleum was modified slightly, as follows:

1. Refinery stocks, or stocks of crude held at refineries, are now reported both by location of storage and by fields of origin; prior to 1930 such stocks were reported by location only.
2. Pipe-line and tank-farm stocks of crude petroleum continued to be reported by fields of origin; but the classification of gross stocks was abandoned, and stocks are now reported on the net basis only. The districts used in reporting crude stocks were reclassified, the principal changes being the separation of Pennsylvania-grade crude from other Appalachian crudes, west Texas and southeast New Mexico from the Mid-Continent, and the division of Gulf coast to show separate figures for grades A and B.
3. The classification of foreign crude held by importers was discontinued, and the relatively small amounts of crude formerly reported under that heading are now included in refinery storage.
4. Producers' stocks, or crude petroleum held at the wells on the producing properties, remained unchanged.
5. Crude stocks reported for California remained on practically the same basis; that is, there were two main classes, light or refinable crude (20° and above) and heavy crude (below 20°) including fuel oil. Beginning with January 1, 1930, stocks of gas oil in California (about 5,000,000 barrels) were segregated from the heavy-crude and fuel-oil stocks and combined with stocks of gas oil held east of California. Stocks in California include all crude petroleum and residual fuel oil held on the Pacific coast of the United States.

For the first time since 1926, the trend in crude stocks changed in 1930, when there was a net withdrawal. On December 31, 1930, total stocks of crude petroleum, including fuel oil in California, amounted to 512,230,000 barrels, a decline of about 23,300,000 barrels from the previous year. This material withdrawal is in contrast to the experience of 1929, when nearly 50,000,000 barrels were added to stocks. (See fig. 57.) The main reason for this complete reversal in the trend of crude stocks was the decline of more than 100,000,000 barrels in output of crude. The most notable decline in crude stocks in 1930 was in stocks of west Texas and southeast New Mexico grades. Refinery stocks declined about 5,000,000 barrels in 1930, the greatest change occurring in the Texas Gulf coast district. Stocks of refinable crude on the Pacific coast showed a

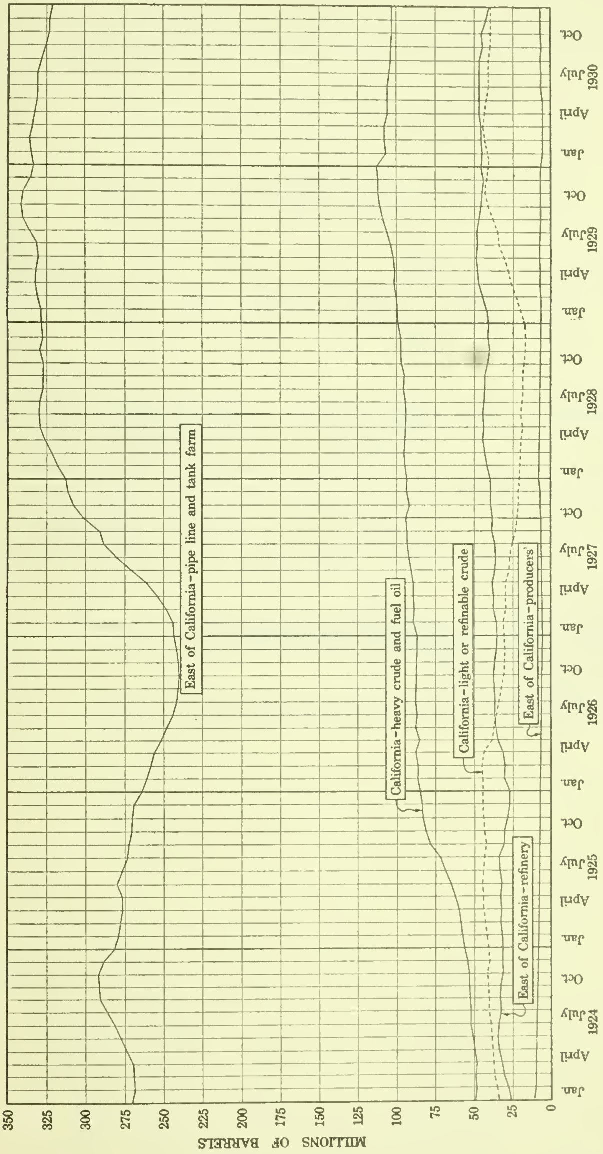

FIGURE 57.—Stocks of crude petroleum, 1924-1930, by months

small decline, but stocks of heavy crude and fuel oil in that district declined for the first time since the classification was established in 1924. The curtailment in crude production in 1930 resulted in a comparative shortage of crude in some districts and contributed considerable strength to prices. In some instances crude that had been stored for five or more years was withdrawn from storage, but in general the older crude was held in the hope of higher prices.

Stocks of crude petroleum in the United States on December 31, 1925–1930

[Thousands of barrels of 42 U. S. gallons]

Year	Refinery stocks of crude petroleum[1]	Pipe-line and tank-farm stocks of domestic crude petroleum, by fields of origin								Producers' stocks[1]	Foreign petroleum held by importers	Total
		Appalachian	Lima-Indiana	Illinois-southwestern Indiana	Mid-Continent	Gulf coast	Rocky Mountain	California[2]	Total			
1925	27,157 [3] 29,200	8,493	971	10,582	195,941	19,263	28,995	129,434 [4] 130,234	393,679 [4] 394,479	7,560	407	428,803 [3] [4] 431,646
1926	35,475	7,790	666	11,770	173,848	20,031	28,075	118,131 [5] 119,170	360,311 [5] 361,350	5,904	609	402,299 [5] 403,338
1927	39,317	7,334	1,134	12,170	246,839	17,922	27,238	113,805	426,442	7,536	84	473,379
1928	40,529	5,515	1,162	11,367	265,748	18,272	25,501	115,914 [6] 116,973	443,479 [6] 444,538	6,521	259	490,788 [6] 491,847
1929	46,195	5,239	544	10,411	273,912	20,129	24,656	153,455 [7] 148,118	488,346 [7] 483,009	6,198	112	540,851 [7] 535,514
1930	[8] 41,136	6,492	[9] 1,453	10,252	259,139	18,255	25,149	143,746	464,486	6,608	([8])	512,230

[1] Exclusive of California.
[2] Includes refinery and producers' stocks and fuel oil.
[3] Includes 2,043,000 barrels in coastwise transit—for comparison with 1926 figures.
[4] Includes 800,000 barrels working stocks not previously recorded.
[5] Figures for comparison with succeeding years.
[6] Figures for comparison with 1929.
[7] Figures for comparison with 1930.
[8] Foreign petroleum held by importers included with refinery stocks.
[9] Includes Michigan.

Stocks of crude petroleum held in the United States at end of each month, 1930

[Thousands of barrels of 42 U. S. gallons]

	January	February	March	April	May	June	July	August	September	October	November	December
East of California:												
At refineries, by location of storage—												
East coast—												
Domestic	8, 353	8, 406	8, 876	8, 646	9, 370	9, 599	10, 227	10, 969	10, 306	10, 759	11, 038	10, 451
Foreign	3, 881	4, 539	5, 064	5, 203	4, 650	4, 349	4, 198	3, 706	3, 668	3, 423	3, 111	2, 816
Appalachian	2, 930	2, 928	3, 001	3, 105	3, 079	3, 078	2, 977	2, 857	2, 638	2, 628	2, 595	2, 505
Indiana, Illinois, Kentucky, etc	3, 036	3, 277	3, 333	3, 280	3, 185	3, 181	3, 150	3, 199	2, 978	3, 053	3, 048	2, 541
Oklahoma, Kansas, and Missouri	5, 395	5, 446	5, 281	5, 473	5, 760	5, 653	5, 372	5, 283	5, 274	5, 239	5, 078	4, 955
Texas—												
Inland	2, 246	1, 850	2, 105	2, 226	2, 428	2, 193	2, 282	2, 144	1, 982	1, 566	1, 414	1, 320
Gulf coast—												
Domestic	10, 317	10, 669	9, 992	10, 893	10, 846	9, 898	9, 752	9, 455	8, 971	9, 688	7, 814	7, 763
Foreign	346	299	271	288	264	221	219	338	317	324	309	343
Arkansas and inland Louisiana	985	969	994	1, 034	993	1, 059	1, 105	1, 112	984	968	805	813
Louisiana, Gulf coast—												
Domestic	4, 056	4, 228	4, 146	4, 194	4, 252	5, 012	5, 432	5, 314	5, 736	5, 803	5, 834	5, 242
Foreign	1, 372	1, 320	1, 216	1, 165	836	895	855	719	768	855	732	694
Rocky Mountain	1, 591	1, 647	1, 646	1, 645	1, 827	1, 634	1, 571	1, 689	1, 823	1, 726	1, 679	1, 693
Total at refineries	44, 508	45, 578	45, 925	47, 152	47, 490	46, 772	47, 140	46, 785	45, 445	46, 032	43, 457	41, 136
At refineries, by fields of origin—												
Pennsylvania grade	2, 624	2, 695	2, 842	2, 787	2, 913	2, 881	2, 737	2, 679	2, 403	2, 421	2, 292	2, 320
Other Appalachian (including Kentucky)	945	916	939	921	898	809	842	877	935	919	921	785
Lima-northeastern Indiana-Michigan	224	138	161	224	219	100	118	148	162	203	127	85
Illinois-southwestern Indiana	196	159	155	127	128	131	122	127	96	87	121	86
North Louisiana and Arkansas	4, 989	4, 732	4, 711	4, 728	4, 602	4, 765	4, 880	4, 851	5, 268	5, 182	5, 085	4, 483
West Texas and southeastern New Mexico	4, 621	4, 646	4, 569	4, 160	4, 732	4, 854	5, 166	5, 286	4, 866	5, 010	5, 412	5, 311
Oklahoma, Kansas, north Texas, etc	16, 933	17, 183	16, 899	17, 403	17, 988	18, 615	19, 047	18, 833	17, 485	18, 074	16, 266	15, 537
Gulf coast—												
Grade A	3, 728	4, 220	4, 592	4, 817	4, 657	4, 314	4, 336	4, 323	4, 253	4, 137	3, 953	3, 742
Grade B	3, 016	3, 043	2, 821	3, 650	3, 742	3, 181	3, 050	3, 209	3, 402	3, 671	3, 449	3, 241
Rocky Mountain	1, 591	1, 647	1, 644	1, 643	1, 825	1, 631	1, 569	1, 688	1, 817	1, 726	1, 674	1, 688
California	42	41	41	36	36	26	1	1	5	--------	5	5
Foreign	5, 599	6, 158	6, 551	6, 656	5, 750	5, 465	5, 272	4, 763	4, 753	4, 602	4, 152	3, 853
Total at refineries	44, 508	45, 578	45, 925	47, 152	47, 490	46, 772	47, 140	46, 785	45, 445	46, 032	43, 457	41, 136

Stocks of crude petroleum held in the United States at end of each month, 1930—Continued

[Thousands of barrels of 42 U. S. gallons]

	January	February	March	April	May	June	July	August	September	October	November	December
East of California—Continued.												
Pipe-line and tank-farm stocks—by fields of origin—												
Pennsylvania grade	4,622	4,799	4,954	5,277	5,650	5,930	6,098	5,802	5,635	5,629	5,618	5,581
Other Appalachian (including Kentucky)	802	923	995	1,012	1,084	1,045	979	928	913	950	905	911
Lima-northeastern Indiana-Michigan	677	802	790	892	995	1,085	1,294	1,457	1,503	1,407	1,311	1,453
Illinois-southwestern Indiana	10,200	10,085	10,196	10,206	10,159	10,124	10,256	10,286	10,091	10,188	10,380	10,252
North Louisiana and Arkansas	21,545	21,504	21,343	21,240	21,232	21,729	21,343	21,423	20,842	20,279	20,163	19,957
West Texas and southeastern New Mexico	53,271	52,696	52,838	52,004	49,753	48,824	48,450	47,610	46,395	45,913	45,945	45,414
Oklahoma, Kansas, north Texas, etc	199,286	200,044	198,476	197,787	198,703	198,970	199,198	197,871	196,271	195,787	195,577	193,768
Gulf coast—												
Grade A	9,029	8,874	8,350	7,758	7,856	7,756	7,929	7,561	7,096	6,339	6,664	6,629
Grade B	11,225	11,285	11,374	11,839	11,495	11,480	11,400	11,332	11,750	12,274	11,892	11,626
Rocky Mountain	24,405	24,488	24,561	24,543	24,417	24,294	24,268	24,172	24,299	24,447	24,696	25,149
Total pipe-line and tank-farm	335,062	335,500	333,877	332,558	331,344	331,237	331,215	328,442	324,795	323,213	323,151	320,740
Producers' stocks	6,301	6,038	6,150	6,057	6,142	6,449	6,341	6,724	6,523	6,623	6,688	6,608
Total crude stocks east of California	385,871	387,116	385,952	385,767	384,976	384,458	384,696	381,951	376,763	375,868	373,296	368,484
California:												
Light crude (20° and above)	41,868	44,241	44,710	44,166	42,982	41,045	41,071	40,671	40,432	40,338	40,472	40,325
Heavy crude (below 20° and including fuel oil)	107,199	107,853	107,567	105,917	105,775	105,632	104,958	104,163	103,705	102,530	103,253	103,421
Total California	149,067	152,094	152,277	150,083	148,757	146,677	146,029	144,834	144,137	142,868	143,725	143,746
Grand total	534,938	539,210	538,229	535,850	533,733	531,135	530,725	526,785	520,900	518,736	517,021	512,230

CONSUMPTION

The chief use of crude petroleum is as a raw material for the manufacture of refined petroleum products, but a small portion of the output is burned as fuel without treatment. The use of domestic crude petroleum as fuel probably reached its peak in 1925, when a surplus of heavy Smackover crude was available. Since 1925 this use has declined both in California, which is now the leading district in this type of utilization, and in States east of California.

Complete data as to the distribution of crude petroleum in the United States in 1930 are not available; however, a fairly accurate breakdown of the main classes of consumption may be made. These data for the past five years are given herewith. In 1930 the consumption of crude at refineries amounted to 96.6 per cent of the total distribution; the remaining 3.4 per cent was divided among several types of fuel uses, exports, and losses of various kinds. (See fig. 58.) The proximity of crude oil to drilling wells on proved fields and to pumping stations along pipe lines is often the determining factor in selecting it for power rather than some other fuel. However, both the consumption of crude as fuel on the leases and in the operations of pipe lines has declined in recent years.

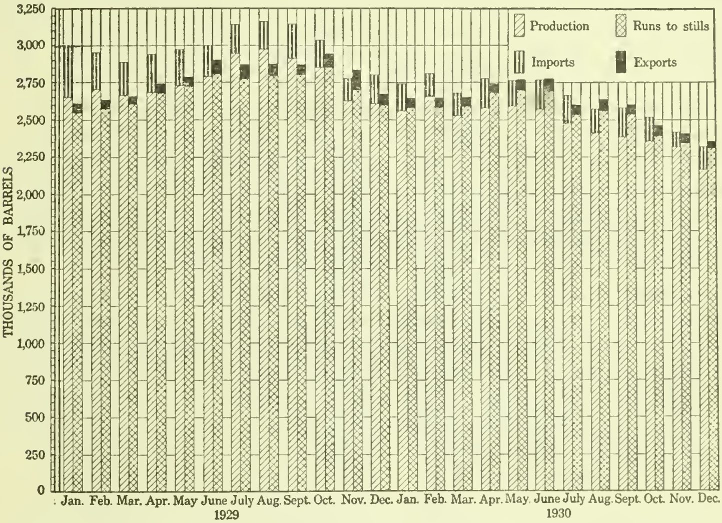

FIGURE 58.—Daily average production, imports, runs to stills, and exports of crude petroleum, 1929 and 1930, by months

In 1921 and 1922 large amounts of crude were imported and burned as fuel without refining. Substantial quantities of "topped" crude undoubtedly were classified directly as crude oil in these earlier figures. The average crude now being brought into this country contains a much higher percentage of light products than did the heavy Panuco crude from Mexico, hence only a relatively small percentage of the imports of recent years has been burned directly as fuel. In 1930, for example, imports of crude amounted to 62,129,000 barrels and that drawn from storage to 2,232,000 barrels, a total of 64,361,000 barrels. On the other hand, total runs of foreign crude to stills amounted to 60,832,000 barrels, leaving only 3,529,000 barrels burned as fuel and to cover losses.

Of the total crude runs to stills in 1930, 866,615,000 barrels (93 per cent) were domestic crude and 60,832,000 barrels (7 per cent) foreign crude. In comparison with 1929, these figures represent declines in use of both types of crude, the larger percentage decrease affecting foreign crude. There was a marked contrast between the monthly record of crude runs to stills in 1930 and 1929; in 1929 crude runs reached their peak in August, and at the end of the year were at a higher level than on January 1; but in 1930 crude runs were at their highest level in May, and the December total was considerably under that of January. This difference indicates that a greater effort was made in 1930 to limit the amount of crude processed to prevent overproduction of gasoline. Practically all the major refining districts used less crude oil in 1930 than in 1929; the most notable exception was Texas. The largest decline in crude runs in 1930 occurred in California, where the material drop in output and the necessity of reducing gasoline production to prevent any further accumulation in stocks led to curtailed operations at refineries. The largest decline in runs of foreign crude to stills in 1930 occurred at the refineries along the Atlantic seaboard (East coast); however, as the decrease in foreign crude processed in the Texas and Louisiana Gulf coasts was proportionally higher the relative importance of the East coast district in the use of this type of crude increased.

Undoubtedly, the chief factor influencing the consumption of crude at refineries is the gasoline yield. Up to 1930 the increased demand for gasoline was met in two ways: Through a steady increase in the percentage of gasoline recovered and through a gradual gain in crude runs to stills. In 1930, however, the increase in the demand for gasoline was considerably below the average, and the annual gain in percentage yield was close to the average; hence, the amount of crude required was considerably less. This increase in the percentage yield of gasoline in recent years has resulted largely from growing use of the cracking process. Although modern cracking units can be run on crude oil the charging stock generally used is fuel oil. This practice has greatly reduced crude-oil requirements; for example, to produce the 164,443,000 barrels of cracked gasoline manufactured in 1930 would have required about 675,000,000 barrels of crude oil if skimming methods had been employed.

Summary of consumption of crude petroleum, 1925–1930

[Thousands of barrels of 42 U. S. gallons]

	1925	1926	1927	1928	1929	1930
Production	763, 743	770, 874	901, 129	901, 474	1, 007, 323	898, 011
Imports	61, 824	60, 382	58, 383	79, 767	78, 933	62, 129
Total new supply	825, 567	831, 256	959, 512	981, 241	1, 086, 256	960, 140
Runs to stills	739, 920	779, 264	828, 835	913, 295	987, 708	927, 447
Exports	13, 337	15, 407	15, 844	18, 966	26, 401	23, 705
Consumed as fuel on producing properties	4, 286	3, 079	2, 824	2, 260	2, 021	1, 643
Consumed as fuel in operation of pipe lines east of California	1, 825	1, 993	2, 097	1, 860	1, 840	1, 621
Changes in stocks east of California and in stocks of light crude in California	−17, 835	−30, 834	+64, 631	+12, 209	+35, 816	−19, 636
Consumed as fuel, losses, and changes in stocks of heavy oil in California	84, 034	62, 347	45, 281	32, 651	32, 470	25, 360
Total demand	825, 567	831, 256	959, 512	981, 241	1, 086, 256	960, 140

Crude petroleum run to stills at refineries in the United States, 1930, by districts and months

[Thousands of barrels of 42 U. S. gallons]

	January	February	March	April	May	June
East coast:						
Domestic	9,863	8,518	9,804	9,814	9,723	9,719
Foreign	4,726	4,158	4,249	4,686	5,078	4,946
Appalachian	2,685	2,600	2,778	2,881	3,047	2,688
Indiana, Illinois, Kentucky, etc	9,429	8,363	10,131	10,169	10,442	9,869
Oklahoma, Kansas, and Missouri	9,270	8,323	9,851	10,408	10,589	9,747
Texas:						
Inland	4,873	4,802	5,076	5,251	5,648	5,353
Gulf coast—						
Domestic	13,352	12,299	13,800	12,439	13,815	13,193
Foreign	183	148	83	66	92	70
Arkansas and inland Louisiana	2,019	1,764	1,986	2,093	1,770	1,622
Louisiana, Gulf coast:						
Domestic	3,426	3,198	3,091	2,954	3,303	3,272
Foreign	204	185	258	259	448	237
Rocky Mountain	1,766	1,661	1,802	1,948	1,970	2,020
California	18,367	16,395	17,343	17,466	17,722	18,011
	80,163	72,414	80,252	80,434	83,647	80,747

	July	August	September	October	November	December	The year
East coast:							
Domestic	9,633	10,075	9,933	9,813	8,948	9,444	115,287
Foreign	5,078	5,220	4,684	4,998	4,679	4,531	57,033
Appalachian	2,662	2,771	2,632	2,455	2,343	2,514	32,056
Indiana, Illinois, Kentucky, etc	9,384	9,136	8,940	7,963	7,655	8,038	109,519
Oklahoma, Kansas, and Missouri	9,546	8,936	8,986	8,837	8,325	8,171	110,989
Texas:							
Inland	5,476	5,208	4,875	4,651	4,540	4,647	60,400
Gulf coast—							
Domestic	12,270	13,415	13,200	12,626	11,691	11,762	153,862
Foreign	89	130	79	56	36	18	1,050
Arkansas and inland Louisiana	1,767	1,614	1,472	1,712	1,553	1,287	20,659
Louisiana, Gulf coast:							
Domestic	3,224	3,403	3,092	2,956	3,017	3,150	38,086
Foreign	238	284	145	219	129	143	2,749
Rocky Mountain	1,836	1,823	1,689	1,588	1,494	1,332	20,929
California	17,441	17,274	16,223	16,142	15,900	16,544	204,828
	78,644	79,289	75,950	74,016	70,310	71,581	927,447

Indicated deliveries of crude petroleum (east of California) to domestic consumers, 1930, by months [1]

[Thousands of barrels of 42 U. S. gallons]

	January	February	March	April	May	June
Domestic petroleum, by fields of origin:						
Appalachian—						
Pennsylvania grade	2,110	1,877	1,970	2,129	1,937	1,878
Other (including Kentucky)	917	706	729	853	820	944
Lima-northeastern Indiana-Michigan	430	471	480	320	367	491
Illinois-southwestern Indiana	798	721	549	569	674	627
Mid-Continent—						
Northern Louisiana and Arkansas	3,031	3,142	3,227	3,109	2,976	2,240
West Texas-southeastern New Mexico	10,893	10,357	10,607	11,097	11,811	10,502
Other (Oklahoma, Kansas, north Texas, etc.)	32,274	28,620	34,180	33,956	34,478	33,469
Gulf coast—						
Grade A	2,761	2,295	2,883	2,974	2,645	2,977
Grade B	3,628	2,869	3,557	1,991	3,722	3,987
Rocky Mountain [2]	1,929	1,740	1,977	2,074	2,013	2,217
California	28	18	24	21	18	26
Total demand	58,799	52,816	60,183	59,093	61,461	59,358
Exports	1,056	1,128	1,071	1,083	1,449	1,758
Domestic demand	57,743	51,688	59,112	58,010	60,012	57,600
Foreign petroleum	5,936	3,762	4,434	5,676	5,890	6,052
	63,679	55,450	63,546	63,686	65,902	63,652

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[1] Indicated deliveries equal production plus imports plus stocks at beginning of period, minus exports and stocks at end of period. In 1929 crude stocks held at refineries are not included.

[2] Includes Alaska.

Indicated deliveries of crude petroleum (east of California) to domestic consumers, 1930, by months [1]—Continued

[Thousands of barrels of 42 U. S. gallons]

	July	August	September	October	November	December	The year
Domestic petroleum, by fields of origin:							
Appalachian—							
Pennsylvania grade	1,875	1,977	2,198	1,915	1,860	1,766	23,492
Other (including Kentucky)	928	834	787	807	754	880	9,959
Lima-northeastern Indiana-Michigan	255	218	305	419	514	266	4,536
Illinois-southwestern Indiana	506	584	702	409	215	637	6,991
Mid-Continent—							
Northern Louisiana and Arkansas	3,210	2,808	2,924	3,496	2,925	3,676	36,764
West Texas-southeastern New Mexico	10,510	10,695	10,993	10,234	8,791	9,446	125,936
Other (Oklahoma, Kansas, north Texas, etc.)	32,307	32,944	33,233	30,481	29,515	29,469	384,926
Gulf coast—							
Grade A	2,404	2,891	2,995	3,297	2,050	2,444	32,616
Grade B	3,712	3,424	2,610	2,448	3,734	3,741	39,423
Rocky Mountain [2]	2,010	1,975	1,718	1,934	1,668	1,424	22,679
California	36	14	16	8	--------	--------	209
Total demand	57,753	58,364	58,481	55,448	52,026	53,749	687,531
Exports	1,396	1,675	1,507	1,575	842	792	15,332
Domestic demand	56,357	56,689	56,974	53,873	51,184	52,957	672,199
Foreign petroleum	6,070	5,568	5,818	5,212	4,917	5,026	64,361
	62,427	62,257	62,792	59,085	56,101	57,983	736,560

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[1] Indicated deliveries equal production plus imports plus stocks at beginning of period, minus exports and stocks at end of period. In 1929 crude stocks held at refineries are not included.

[2] Includes Alaska.

PRICES AND VALUES

The total value of crude petroleum produced in the United States in 1930 was $1,070,200,000, a decrease from 1929 of $210,217,000 (16 per cent). The major portion of this decline in total value resulted from the drop in production, although a material part of it was due to lowered prices. The average value per barrel in 1930 was $1.19, compared with $1.27 in 1929, $1.17 in 1928, and $1.34 for the period 1859 to 1930. The only other year in which the average value was $1.19 was 1900.

The record of average values by States for 1930, compared with 1929, discloses a marked reversal in the trend of prices. For example, the 1929 averages showed that there were only two States, exclusive of Alaska and Utah, that had a lower average than in 1928. In 1930, however, there was only one State, California, that had a higher average than in 1929. The most severe declines in average values in 1930 were recorded in the Eastern States, a reflection of the sharp reduction in the prices of Pennsylvania-grade crude. The producers in New York received the highest average price for their crude—$2.70 per barrel; those in west Texas, the lowest—$0.80 per barrel.

In 1930, as in 1928 and 1929, the Appalachian field led all others in number of changes in posted prices for crude. (See fig. 59.) This condition arises from a number of causes, chief of which are the facts that the high prices paid in that field offer more opportunity for changes in postings and that the marketing conditions in the area are such as to make prices particularly sensitive to changes in supply and demand. In general, posted prices in the fields that produce Pennsylvania-grade crude fell off steadily from January to July, 1930, were then advanced in response to a marked improvement in statistical

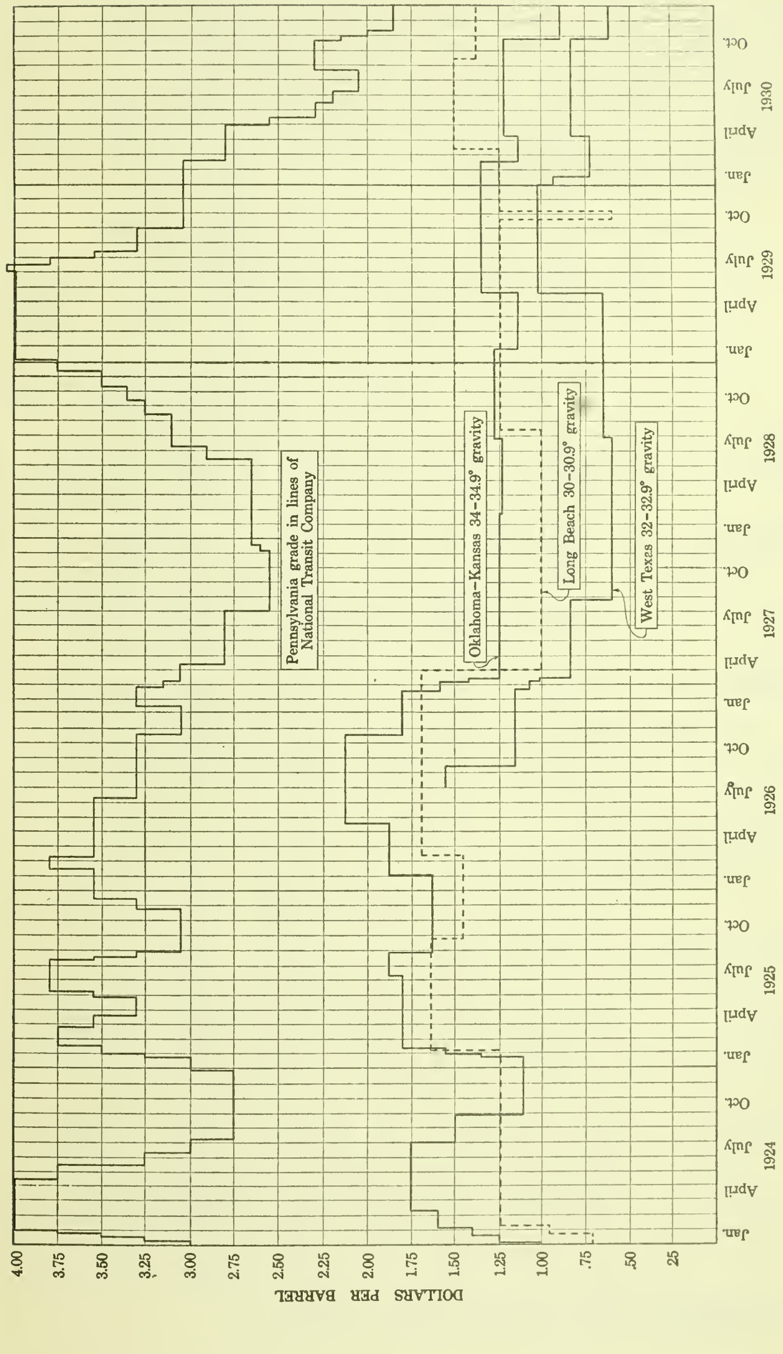

FIGURE 59.—Posted prices of selected grades of crude petroleum, 1924–1930

position, but weakened again late in the year when consumption declined rapidly. The movement of posted prices in the Kentucky, Indiana, and Illinois fields in 1930 was quite similar to that in the fields to the east, except that there was no recovery in August. Posted prices in the Mid-Continent field, which are generally taken as indicative of conditions throughout the industry, fell off early in the year, rose in late spring when demand by refiners was brisk, but fell again late in the year. The posted prices for crude in California reflected the decline in output and for most grades were higher at the end of the year than at the beginning.

Value of crude petroleum at the wells, 1926–1930, by States

[Totals in thousands of dollars; averages in dollars per barrel]

	1926		1927		1928		1929		1930	
	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Arkansas	64, 600	1. 11	42, 400	1. 06	27, 450	0. 86	21, 890	0. 88	17, 390	0. 88
California [1]	345, 547	1. 54	260, 735	1. 13	230, 000	. 99	321, 367	1. 10	271, 699	1. 20
Colorado	5, 100	1. 84	3, 400	1. 20	2, 750	. 99	2, 380	1. 01	1, 480	. 89
Illinois	17, 200	2. 22	11, 700	1. 67	9, 980	1. 54	10, 430	1. 65	9, 100	1. 59
Indiana:										
Southwestern	1, 460	2. 22	1, 200	1. 65	1, 470	1. 53	1, 520	1. 66	1, 540	1. 64
Northeastern	310	2. 07	190	1. 51	110	1. 24	90	1. 43	70	1. 32
Total, Indiana	1, 770	2. 19	1, 390	1. 63	1, 580	1. 50	1, 610	1. 64	1, 610	1. 62
Kansas	93, 800	2. 26	58, 300	1. 42	52, 500	1. 36	62, 510	1. 46	54, 880	1. 32
Kentucky	15, 250	2. 43	11, 220	1. 67	11, 850	1. 61	13, 220	1. 70	11, 080	1. 50
Louisiana:										
Gulf coast	5, 750	1. 39	6, 110	1. 21	8, 150	1. 16	9, 150	1. 23	9, 200	1. 07
Northern	32, 450	1. 70	23, 630	1. 33	17, 700	1. 20	16, 550	1. 26	16, 910	1. 15
Total, Louisiana	38, 200	1. 65	29, 740	1. 30	25, 850	1. 18	25, 700	1. 25	26, 110	1. 12
Michigan	253	2. 69	832	1. 90	920	1. 55	6, 140	1. 36	5, 160	1. 32
Montana	10, 170	1. 32	7, 090	1. 40	6, 400	1. 59	7, 260	1. 82	5, 420	1. 62
New Mexico:										
Northwestern	3, 270	1. 96	1, 680	1. 37	1, 280	1. 36	2, 170	1. 19	900	1. 45
Southeastern									8, 280	. 87
Total, New Mexico	3, 270	1. 96	1, 680	1. 37	1, 280	1. 36	2, 170	1. 19	9, 180	. 90
New York	7, 200	3. 68	7, 110	3. 17	8, 750	3. 36	13, 170	3. 90	9, 850	2. 70
Ohio:										
Central and eastern	14, 780	2. 74	11, 900	2. 02	11, 950	2. 20	13, 200	2. 51	10, 020	1. 94
Northwestern	4, 400	2. 34	3, 070	1. 80	2, 520	1. 59	2, 570	1. 73	1, 940	1. 48
Total, Ohio	19, 180	2. 64	14, 970	1. 97	14, 470	2. 06	15, 770	2. 34	11, 960	1. 84
Oklahoma	413, 900	2. 31	397, 200	1. 43	347, 600	1. 39	364, 650	1. 43	279, 250	1. 29
Pennsylvania	31, 930	3. 56	29, 150	3. 06	32, 550	3. 27	44, 800	3. 79	33, 410	2. 61
Tennessee	100	2. 33	90	1. 50	70	1. 52	30	1. 58	26	1. 24
Texas:										
Gulf coast	61, 850	1. 50	61, 119	1. 30	47, 120	1. 19	59, 930	1. 21	63, 650	1. 04
West Texas	246, 850	1. 96	41, 327	. 80	80, 520	. 65	110, 780	. 83	87, 040	. 80
Rest of State			146, 104	1. 23	108, 660	1. 15	151, 810	1. 33	137, 720	1. 14
Total, Texas	308, 700	1. 85	248, 550	1. 14	236, 300	. 92	322, 520	1. 09	288, 410	. 99
West Virginia	20, 560	3. 46	17, 410	2. 89	17, 150	3. 03	20, 070	3. 60	11, 820	2. 33
Wyoming	51, 020	1. 98	29, 830	1. 40	27, 400	1. 28	24, 700	1. 28	22, 350	1. 25
Other [2]	10	1. 25	33	4. 71	30	5. 00	30	4. 29	15	2. 14
United States	1,447,760	1. 88	1,172,830	1. 30	1,054,880	1. 17	1,280,417	1. 27	1,070,200	1. 19

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[1] Division of Mines, Department of Natural Resources, California.
[2] Alaska and Utah.

Average monthly prices per barrel for selected grades of crude petroleum at wells, 1930

	Pennsylvania grade [1]	Oklahoma-Kansas (38°-38.9°)	Gulf Coast Grade A	Illinois	Lima, Ohio	Panhandle (Carson and Hutchinson Counties 35°-35.9°)	California (Long Beach 30°-30.9°)	West Texas (Crane-Upton, etc., 30°-30.9°)
January	$3.00	$1.55	$1.16	$1.75	$1.80	$0.97	$1.25	$0.83
February	2.89	1.41	1.05	1.68	1.73	.87	1.25	.73
March	2.75	1.26	1.05	1.60	1.65	.87	1.42	.73
April	2.75	1.33	1.12	1.63	1.68	.93	1.50	.80
May	2.37	1.36	1.15	1.65	1.70	.96	1.50	.83
June	2.20	1.36	1.15	1.65	1.68	.96	1.50	.83
July	2.05	1.36	1.15	1.65	1.55	.96	1.50	.83
August	2.08	1.36	1.15	1.65	1.55	.96	1.50	.83
September	2.25	1.36	1.15	1.65	1.55	.96	1.44	.83
October	2.20	1.30	1.13	1.60	1.49	.87	1.38	.80
November	1.86	1.01	.80	1.30	1.10	.72	1.38	.62
December	1.80	1.01	.80	1.30	1.10	.72	1.38	.62
	2.35	1.31	1.07	1.59	1.55	.90	1.42	.77

[1] In lines of Southwest Pennsylvania Pipe Line Co.

Posted price per barrel of petroleum, at wells in 1930, by grades, with dates of change

Date	Appalachian field[1]													Lima-Indiana field[2]		Illinois and southwestern Indiana field[2]		
	Pennsylvania grade					Cabin Creek[4]	Corning grade in lines of Buckeye Pipe Line Co.[5]	Wooster[2]	Ragland	Somerset grade		Wayne Co., Ky., in lines of Cumberland Pipe Line Co.	Western Kentuck	Lima, Ohio	Indiana	Illinois and Princeton, Ind.	Plymouth	Waterloo
	Bradford and Allegany districts[3]	In lines of National Transit Co.	In lines of Southwest Pennsylvania Pipe Line Co.	In lines of Eureka Pipe Line Co.	In lines of Buckeye Pipe Line Co.					In lines of Cumberland Pipe Line Co.	In lines of Eureka Pipe Line Co.							
Jan. 1	$3.05	$3.05	$3.00	$2.90	$2.70	$3.15	$1.80	$1.90	$0.60	$1.55	$1.39	$1.42	$1.68	$1.80	$1.57	$1.75	$1.28	$1.35
Feb. 5	3.00																	
Feb. 15								1.75					1.50	1.65	1.42	1.60	1.18	
Feb. 17	2.75	2.80	2.75	2.65	2.45	2.90	1.65			1.37	1.21	1.24						
Apr. 11								1.80		1.47	1.31	1.34	1.55	1.70	1.47	1.65	1.23	
May 1	2.50	2.55	2.50	2.40	2.20	2.65												
May 2							1.75											
May 16	(6)	2.30	2.25	2.15	1.95	2.40												
June 2	2.40																	
June 17	2.25	2.20	2.15	2.05	1.90	2.30												
June 26								1.70						1.55	1.32			
July 11	2.10	2.05	2.00	1.90	1.75	2.15												
July 23							1.50			1.30	1.14	1.17						
Aug. 1	2.15																	
Aug. 22	2.50	2.30	2.25	2.15		2.40												
Sept. 13					1.90													
Sept. 18	2.55																	
Oct. 22	2.40	2.15	2.10	2.00	1.75	2.25												
Oct. 23							1.35											
Oct. 28							1.25	1.35					1.15	1.10	.87	1.30	.88	
Oct. 29										1.10	.94	.97						
Nov. 1	2.30	2.00	1.95	1.85	1.60	1.85												
Nov. 12	2.15	1.85	1.80	1.70	1.45	1.70												
Dec. 15										(7)	(7)							
Dec. 31							1.15											
Average for year	2.50	2.40	2.35	2.25	2.03	2.45	1.58	1.69	.60			1.23	1.49	1.55	1.32	1.59	1.17	1.35

[1] The Joseph Seep Purchasing Agency, except as noted.
[2] The Ohio Oil Co.
[3] Oil run prior to July 1, 1929, 5 cents less, until May 16, 1930.
[4] The Pure Oil Co.
[5] Oil run prior to Sept. 15, 1926, posted at 10 cents less, until May 16, 1930.
[6] The Joseph Seep Purchasing Agency withdrew from Bradford and Allegany fields as a purchaser on May 16; prices after that date posted by Tide-Water Pipe Co. (Ltd.).
[7] Discontinued.

Date	Michigan																	
	Midland [1]	Muskegon [2]													Saginaw [3]			
		Traverse and Dundee													47°			
		32°–32.9°	33°–33.9°	34°–34.9°	35°–35.9°	36°–36.9°	37°–37.9°	38°–38.9°	39°–39.9°	40°–40.9°	41°–41.9°	42°–42.9°	43°–43.9°	44° and above				
Jan. 1	$1.50	$1.25	$1.30	$1.35	$1.40	$1.45	$1.50	$1.55	$1.60	$1.65	$1.70	$1.75	$1.80	$1.85	$1.80			
Feb. 6	1.25																	
Feb. 13		1.08	1.11	1.14	1.17	1.20	1.23	1.26	1.29	1.32	1.35	1.38	1.41	1.44				
															Below 44°			44° and above
Feb. 22															$1.38			$1.44
															Below 42°	42°–42.9°	43°–43.9°	
Mar. 1															$1.35	$1.38	$1.41	
Apr. 16		1.15	1.18½	1.22	1.25½	1.29	1.32½	1.36	1.39½	1.43	1.46½	1.50	1.53½	1.57	1.46½	1.50	1.53½	1.57
Apr. 29	1.35																	
June 5	1.55																	
July 19	1.45																	
Aug. 21	1.30																	
Oct. 27		.81	.85	.89	.92	.95	.98	1.01	1.04	1.07	1.10	1.13	1.16	1.19	1.10	1.13	1.16	1.19
Oct. 28	1.10																	
										40° and above					40° and above			
Nov. 1										$1.07					$1.07			
Dec. 31	1.15																	
Average for year	1.32	1.09	1.13	1.16	1.20	1.23	1.27	1.30	1.34									

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[1] The Pure Oil Co.

[2] Standard Oil Co. of Indiana.

[3] Sun Oil Co.

Posted price per barrel of petroleum, at wells in 1930, by grades, with dates of change—Continued

Date	Mid-Continent field																					
	Kansas-Oklahoma; north and central Texas[1]																					Corsicana[2]
	Below 25°	25°–25.9°	26°–26.9°	27°–27.9°	28°–28.9°	29°–29.9°	30°–30.9°	31°–31.9°	32°–32.9°	33°–33.9°	34°–34.9°	35°–35.9°	36°–36.9°	37°–37.9°	38°–38.9°	39°–39.9°	40°–40.9°	41°–41.9°	42°–42.9°	43°–43.9°	44° and above	Heavy
Jan. 1	$0.85	$0.90	$0.95	$1.00	$1.05	$1.10	$1.15	$1.20	$1.25	$1.30	$1.35	$1.40	$1.45	$1.50	$1.55	$1.60	$1.65	$1.70	$1.75	$1.80	$1.85	$0.80
Jan. 16																						.75
Feb. 15[3]	.60	.66	.72	.78	.84	.90	.96	1.02	1.08	1.11	1.14	1.17	1.20	1.23	1.26	1.29	1.32	1.35	1.38	1.41	1.44	
Apr. 10	.75	.80	.85	.90	.95	1.00	1.05	1.10	1.15	1.18½	1.22	1.25½	1.29	1.32½	1.36	1.39½	1.43	1.46½	1.50	1.53½	1.57	.80
	Below 29°																					
Oct. 27[4]	$0.65					.69	.73	.77	.81	.85	.89	.92	.95	.98	1.01	1.04	1.07	1.10	1.13	1.16	1.19	
Oct. 28																						.75
																	40° and above					
Nov. 1[5]																	$1.07					
Average for year						.94	.99	1.04	1.09	1.13	1.16	1.20	1.23	1.27	1.31	1.34						.78

[1] Prairie Oil & Gas Co., and other major purchasing companies.
[2] Magnolia Petroleum Co.
[3] Posted by Magnolia Petroleum Co., Jan. 16.
[4] Posted by Magnolia Petroleum Co., Oct. 17.
[5] Posted by Magnolia Petroleum Co., Oct. 28.

Date	Mid-Continent field—Continued															
	South central and eastern Texas															South-west Texas, Mirando [2]
	Luling [1]	Pettus [2]	Salt Flat and Darst [2]	Somerset [3]											Van [4]	
				Below 33°					33°–33.9°	34°–34.9°	35°–35.9°	36°–36.9°	37°–37.9°	38° and above		
Jan. 1	$0.90	-----	$1.25	$1.05					$1.07	$1.09	$1.11	$1.13	$1.15	$1.17	$1.40	$0.90
Jan. 15	-----	-----	1.05	-----					-----	-----	-----	-----	-----	-----	1.17	.75
Jan. 16	.75	-----	-----	-----					-----	-----	-----	-----	-----	-----	-----	.70
Apr. 1	-----	$1.30	-----	-----					-----	-----	-----	-----	-----	-----	-----	-----
Apr. 10	.85	1.40	1.15	-----					-----	-----	-----	-----	-----	-----	1.25½	.85
Aug. 21	-----	1.15	-----	-----					-----	-----	-----	-----	-----	-----	-----	-----
Oct. 27	-----	-----	-----	-----					-----	-----	-----	-----	-----	-----	.89	-----
				Below 29°	29°–29.9°	30°–30.9°	31°–31.9°	32°–32.9°								
Oct. 28	.75	1.10	.90	$0.65	$0.69	$0.73	$0.77	$0.81	.85	.89	.92	.95	.98	1.01	-----	.75
Average for year	.81	1.26	1.09	.98	.99	.99	1.00	1.01	1.03	1.05	1.08	1.10	1.12	1.14	1.17	.80

[1] Magnolia Petroleum Co.
[2] Humble Oil & Refining Co.
[3] Grayburg Pipe Line Co.
[4] The Pure Oil Co.

Posted price per barrel of petroleum, at wells in 1930, by grades, with dates of change—Continued

Date	Mid-Continent field—Continued													
	West Texas and southeast New Mexico													
	Crane, Upton, and Winkler,[1] Mitchell, Glasscock-Howard Counties,[2] [3] Tex., and Lea [4] County, N. Mex.													Artesia, N. Mex.[5]
	Below 25°	25°-25.9°	26°-26.9°	27°-27.9°	28°-28.9°	29°-29.9°	30°-30.9°	31°-31.9°	32°-32.9°	33°-33.9°	34°-34.9°	35°-35.9°	36° and above	
Jan. 1	$0.70	$0.74	$0.78	$0.82	$0.86	$0.90	$0.94	$0.98	$1.02	$1.06	$1.10	$1.14	$1.18	$1.08
Jan. 16	.55	.58	.61	.64	.67	.70	.73	.76	.79	.82	.85	.88	.91	
Feb. 15														1.00
Apr. 10	.65	.68	.71	.74	.77	.80	.83	.86	.89	.92	.95	.98	1.01	
Apr. 11														1.05
Oct. 28	.50	.52	.54	.56	.58	.60	.62	.64	.66	.68	.70	.72	.74	.75
Average for year	.60	.63	.66	.69	.72	.75	.77	.80	.83	.86	.89	.92	.95	.99

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[1] Winkler crude quoted 5 cents higher for each grade.

[2] Until Jan. 15, Howard and Glasscock grades were posted as follows: Below 25°—$0.70, with a 4-cent increase for each degree of gravity to 28° and a 2-cent increase for each degree from 28° to 36° and above.

[3] Magnolia Petroleum Co.

[4] Humble Oil & Refining Co.

[5] The Ohio Oil Co.

Date	Mid-Continent field—Continued																				
	Panhandle[1]																				
	Carson and Hutchinson																				
	Below 32°				32°–32.9°	33°–33.9°	34°–34.9°	35°–35.9°	36°–36.9°	37°–37.9°	38°–38.9°	39°–39.9°	40°–40.9°	41°–41.9°	42°–42.9°	43°–43.9°	44° and above
Jan. 1	$0.90				$0.95	$1.00	$1.05	$1.10	$1.15	$1.20	$1.25	$1.30	$1.35	$1.40	$1.45	$1.50	$1.55
Jan. 15	.72				.78	.81	.84	.87	.90	.93	.96	.99	1.02	1.05	1.08	1.11	1.14
Apr. 10	.77½				.82½	.87½	.92½	.96	.99½	1.03	1.06½	1.10	1.13½	1.17	1.20½	1.24	1.27½
	Below 29°	29°–29.9°	30°–30.9°	31°–31.9°													
Oct. 16	$0.55	$0.59	$0.63	$0.67	.71	.75	.79	.82	.85	.88	.91	.94	.97	1.00	1.03	1.06	1.09
													40° and above				
Oct. 28	.45	.49	.53	.57	.61	.65	.69	.72	.75	.78	.81	.84	$0.87				
Average for year	.70	.71	.72	.73	.78	.82	.86	.90	.93	.96	1.00	1.03					

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[1] Humble Oil & Refining Co.

Posted price per barrel of petroleum, at wells in 1930, by grades, with dates of change—Continued

Date	Mid-Continent field—Continued																
	Panhandle [1]—Continued																
	Gray																
	Below 29°	29°–29.9°	30°–30.9°	31°–31.9°	32°–32.9°	33°–33.9°	34°–34.9°	35°–35.9°	36°–36.9°	37°–37.9°	38°–38.9°	39°–39.9°	40°–40.9°	41°–41.9°	42°–42.9°	43°–43.9°	44° and above
Jan. 1	$0.90	$0.95	$1.00	$1.05	$1.10	$1.15	$1.20	$1.25	$1.30	$1.35	$1.40	$1.45	$1.50	$1.55	$1.60	$1.65	$1.70
Jan. 15	.69	.75	.81	.87	.93	.96	.99	1.02	1.05	1.08	1.11	1.14	1.17	1.20	1.23	1.26	1.29
Apr. 10	.75½	.80½	.85½	.90½	.95½	1.00½	1.05½	1.09	1.12½	1.16	1.19½	1.23	1.26½	1.30	1.33½	1.37	1.40½
Oct. 16	.60	.64	.68	.72	.76	.80	.84	.87	.90	.93	.96	.99	1.02	1.05	1.08	1.11	1.14
													40° and above				
Oct. 28	.50	.54	.58	.62	.66	.70	.74	.77	.80	.83	.86	.89	$0.92				
Average for year	.69	.75	.80	.85	.90	.94	.98	1.02	1.05	1.08	1.12	1.15					

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[1] Humble Oil & Refining Co.

Date	Mid-Continent field—Continued															
	Panhandle [1]—Continued															
	Wheeler															
	Below 30°	30°–30.9°	31°–31.9°	32°–32.9°	33°–33.9°	34°–34.9°	35°–35.9°	36°–36.9°	37°–37.9°	38°–38.9°	39°–39.9°	40°–40.9°	41°–41.9°	42°–42.9°	43°–43.9°	44° and above
Jan. 1	$0.90	$0.95	$1.00	$1.05	$1.10	$1.15	$1.20	$1.25	$1.30	$1.35	$1.40	$1.45	$1.50	$1.55	$1.60	$1.65
Jan. 15	.70	.76	.82	.88	.91	.94	.97	1.00	1.03	1.06	1.09	1.12	1.15	1.18	1.21	1.24
Apr. 11	.75½	.80½	.85½	.90½	.95½	1.00½	1.04	1.07½	1.11	1.14½	1.18	1.21½	1.25	1.28	1.32	1.35½
												40° and above				
Oct. 28	.49	.53	.57	.61	.65	.69	.72	.75	.78	.81	.84	$0.87				
Average for year	.70	.75	.80	.85	.90	.94	.97	1.01	1.04	1.07	1.11					

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[1] Humble Oil & Refining Co.

Posted price per barrel of petroleum, at wells in 1930, by grades, with dates of change—Continued

Date	Mid-Continent field—Continued																					
	North Louisiana and Arkansas [1]																					
					Bull Bayou, Caddo, Crichton, De Soto, Haynesville, and Homer, La., and El Dorado, Ark.																	
	Belle-vue extra heavy below 32°	Calion below 24° [2]	Cotton Valley below 36° [3] Sa-repta Carter-ville	Ura-nia [4]	Below 28°	28°–28.9°	29°–29.9°	30°–30.9°	31°–31.9°	32°–32.9°	33°–33.9°	34°–34.9°	35°–35.9°	36°–36.9°	37°–37.9°	38°–38.9°	39°–39.9°	40°–40.9°	41°–41.9°	42°–42.9°	43°–43.9°	44° and above
Jan. 1	$1.30	$0.85	$0.85	$1.10	$1.00	$1.05	$1.10	$1.15	$1.20	$1.25	$1.30	$1.35	$1.40	$1.45	$1.50	$1.55	$1.60	$1.65	$1.70	$1.75	$1.80	$1.85
Jan. 16	1.05	-------	.80	.85	.78	.84	.90	.96	1.02	1.08	1.11	1.14	1.17	1.20	1.23	1.26	1.29	1.32	1.35	1.38	1.41	1.44
Apr. 11	1.15	.90	.85	.95	.87	.92	.97	1.02	1.07	1.12	1.17	1.22	1.25½	1.29	1.32½	1.36	1.39½	1.43	1.46½	1.50	1.53½	1.57
					Below 29°													40° and above				
Oct. 30	[5] 1.00	.70	-------	.75	$0.65		.69	.73	.77	.81	.85	.89	.92	.95	.98	1.01	1.04	$1.07				
Average for year	1.11	.85	.84	.90	--------------		.91	.96	1.01	1.06	1.11	1.15	1.18	1.22	1.25	1.28	1.32	------------------------------------				

[1] Standard Oil Co. of Louisiana, except as noted.
[2] Gulf Refining Co. of Louisiana.
[3] Higher grades posted with same price scale as Bull Bayou.
[4] Louisiana Oil & Refining Co.
[5] No gravity quoted.

Date	Mid-Continent field—Continued							
	North Louisiana and Arkansas [1]—Continued							
	Smackover		Stephens [2]					
	Below 24°	24° and above	Below 28°	28°–28.9°	29°–29.9°	30°–30.9°	31°–31.9°	32° and above
Jan. 1	$0.85	$1.00	$0.90	$0.94	$0.98	$1.02	$1.06	$1.10
Apr. 11	.90	1.05	.70	.81	.86	.91	.96	1.01
			Below 29°					
Oct. 30	$0.70		$0.54		.58	.62	.66	.70
Average for year					.84	.89	.94	.98

[1] Standard Oil Co. of Louisiana, except as noted.

[2] Atlantic Oil Producing Co.

Posted price per barrel of petroleum, at wells in 1930, by grades, with dates of change—Continued

Date	Gulf coast field																											
	Coastal Texas [1]																										Coastal Louisiana [2]	
	High Island	Batson, Saratoga	Grade A	Grade B																					Markham [3]	Refugio [4]	Edgerley, Starks, Vinton, Sorrento [5]	Jennings
				Below 25°	25°–25.9°	26°–26.9°	27°–27.9°	28°–28.9°	29°–29.9°	30°–30.9°	31°–31.9°	32°–32.9°	33°–33.9°	34°–34.9°	35° and above													
Jan. 1	$1.10	$1.30	$1.30	$1.15	$1.18	$1.21	$1.24	$1.27	$1.30	$1.33	$1.36	$1.39	$1.42	$1.45	$1.48										$1.00	$0.70	$1.30	$1.25
Jan. 15	.85	1.05	1.05	.90	.93	.96	.99	1.02	1.05	1.08	1.11	1.14	1.17	1.20	1.23										.75		1.05	1.00
Jan. 17																										.50		
Jan. 20																										.55		
Feb. 11																											([6])	
Apr. 1																										[7].75		
															35°–35.9°	36°–36.9°	37°–37.9°	38°–38.9°	39°–39.9°	40°–40.9°	41°–41.9°	42°–42.9°	43°–43.9°	44° and above				
Apr. 4															$1.23	$1.26	$1.29	$1.32	$1.34	$1.36	$1.38	$1.40	$1.42	$1.44				
Apr. 10	.95		1.15	1.00	1.03	1.06	1.09	1.12	1.15	1.18	1.21	1.24	1.27	1.30	1.33	1.36	1.39	1.42	1.44	1.46	1.48	1.50	1.52	1.54	.85	[7] 85	([6])	1.10
Oct. 28																									.75	[8] .75		
																				40° and above								
Oct. 30	.75		.80	.69	.71	.73	.75	.77	.79	.81	.83	.85	.87	.89	.91	.93	.95	.97	.99	$1.01							([6])	.80
Average for year	.90	1.06	1.07	.93	.96	.99	1.01	1.04	1.07	1.10	1.13	1.16	1.18	1.21	1.24	1.26	1.28	1.30	1.32						.81			1.03

[1] Gulf Pipe Line Co., except as noted.
[2] Gulf Refining Co. of Louisiana.
[3] The Texas Co.
[4] Gulf Coast Pipe Line Co.
[5] Sorrento posted same as Jennings until February 11.
[6] Graded A and B, and posted same as Texas Grade A and B.
[7] Heavy—below 25°. Grades over 25° posted same as Grade B by Humble Oil & Refining Co. and met by Gulf Coast Pipe Line Co.
[8] Heavy—below 25° Grades over 25° posted with 2-cent increase for each degree of gravity from $0.92 for 25°–25.9° to 40° and above.

Date	Rocky Mountain field [1]														
	Big Muddy	Cat Creek, Elk Basin, Greybull, Torchlight, Grass Creek (light)	Dutton Creek	Grass Creek (heavy)	Hamilton Dome	Iles		Lance Creek	Lander and Simpson Ridge [2]	Lost Soldier [2]	Mule Creek	Osage	Poison Spider	Rex-Lake	Rock Creek
						Below 33°	33° and above								
Jan. 1	$1.43	$1.65	$1.25	$0.90	$0.85	$0.87	$0.99	$1.68	$0.80	$1.05	$1.20	$1.65	$1.00	$1.10	$1.40
Feb. 15	1.33	1.45						1.53				1.53			1.25
Feb. 16						.65	.87			.95					
Apr. 11	1.38	1.55	1.35					1.63		1.00		1.63			1.35
Oct. 28	1.00	1.25	1.01					1.33		.80		1.00			1.01
Nov. 1												.85			
Average for year	1.31	1.49	1.26	.90	.85	.68	.89	1.57	.80	.96	1.20	1.48	1.00	1.10	1.28

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[1] The Ohio Oil Co. and Midwest Refining Co., except as noted.

[2] Producers and Refiners Corporation.

Posted price per barrel of petroleum, at wells in 1930, by grades, with dates of change—Continued

Date	Rocky Mountain field [1]—Continued																				
	Salt Creek																				
	Below 25°	25°–25.9°	26°–26.9°	27°–27.9°	28°–28.9°	29°–29.9°	30°–30.9°	31°–31.9°	32°–32.9°	33°–33.9°	34°–34.9°	35°–35.9°	36°–36.9°	37°–37.9°	38°–38.9°	39°–39.9°	40°–40.9°	41°–41.9°	42°–42.9°	43°–43.9°	44° and above
Jan. 1	$0.85	$0.90	$0.95	$1.00	$1.05	$1.10	$1.15	$1.20	$1.25	$1.30	$1.35	$1.40	$1.45	$1.50	$1.55	$1.60	$1.65	$1.70	$1.75	$1.80	$1.85
Feb. 15	.60	.66	.72	.78	.84	.90	.96	1.02	1.08	1.11	1.14	1.17	1.20	1.23	1.26	1.29	1.32	1.35	1.38	1.41	1.44
Apr. 10	.75	.80	.85	.90	.95	1.00	1.05	1.10	1.15	1.18½	1.22	1.25½	1.29	1.32½	1.36	1.39½	1.43	1.46½	1.50	1.53½	1.57
	Below 29°																				
Oct. 27	$0.65					.69	.73	.77	.81	.85	.89	.92	.95	.98	1.01	1.04	1.07	1.10	1.13	1.16	1.19
																	40° and above				
Nov. 1																	$1.07				
Average for year						.94	.99	1.04	1.09	1.13	1.16	1.20	1.23	1.27	1.31	1.34					

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[1] Midwest Refining Co.

Date	Rocky Mountain field [1]—Continued			
	Border	Pondera	Sunburst	Hogback
Jan. 1			$1.75	$1.60
Feb. 1		$1.80		
Feb. 15			1.65	1.40
Apr. 10		1.55		
Oct. 28	$1.55	1.45	1.55	
Average for year	1.55	1.58	1.64	1.42

Date	Rocky Mountain field [2]—Continued																								
	Florence and Canon City	Fort Collins and Wellington																					Rattlesnake		Table Mesa
		Below 25°	25°–25.9°	26°–26.9°	27°–27.9°	28°–28.9°	29°–29.9°	30°–30.9°	31°–31.9°	32°–32.9°	33°–33.9°	34°–34.9°	35°–35.9°	36°–36.9°	37°–37.9°	38°–38.9°	39°–39.9°	40°–40.9°	41°–41.9°	42°–42.9°	43°–43.9°	44° and above	Light	Heavy	
Jan. 1	$1.15	$0.80	$0.85	$0.90	$0.95	$1.00	$1.05	$1.10	$1.15	$1.20	$1.25	$1.30	$1.35	$1.40	$1.45	$1.50	$1.55	$1.60	$1.65	$1.70	$1.75	$1.80	$1.95	$1.06½	$1.95
Feb. 15	.96	.55	.61	.67	.73	.79	.85	.91	.97	1.03	1.06	1.09	1.12	1.15	1.18	1.21	1.24	1.27	1.30	1.33	1.36	1.39	1.68	.79½	1.68
Apr. 10		.75	.75	.80	.85	.90	.95	1.00	1.05	1.10	1.13½	1.17	1.20½	1.24	1.27½	1.31	1.34½	1.38	1.41½	1.45	1.48½	1.52			
Apr. 11	1.05																						1.77½	.89	1.77½
Oct. 27		.60	.60	.60	.60	.60	.64	.68	.72	.76	.80	.84	.87	.90	.93	.96	.99	1.02	1.05	1.08	1.11	1.14	1.43	.54½	1.43
Oct. 28	.73																								
																		40° and above							
Nov. 1																		$1.02							
Av. for year	.99	.70	.71	.76	.80	.84	.89	.94	.99	1.04	1.08	1.11	1.15	1.18	1.22	1.26	1.29						1.72	.83	1.72

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[1] The Ohio Oil Co. and Midwest Refining Co.

[2] Continental Oil Co.

Posted price per barrel of petroleum, at wells in 1930, by grades, with dates of change—Continued

Field and date of change	California [1]													
	14°–14.9°	15°–15.9°	16°–16.9°	17°–17.9°	18°–18.9°	19°–19.9°	20°–20.9°	21°–21.9°	22°–22.9°	23°–23.9°	24°–24.9°	25°–25.9°	26°–26.9°	27°–27.9°
Alamitos Heights, Huntington Beach, Inglewood, Olinda, Brea Canyon, Long Beach, Seal Beach, Torrance, Richfield: [2]														
Jan. 1	$0.70	$0.70	$0.70	$0.70	$0.75	$0.80	$0.85	$0.89	$0.93	$0.97	$1.01	$1.05	$1.09	$1.13
Mar. 11					.76	.82	.88	.94	1.00	1.07	1.14	1.21	1.28	1.35
Sept. 15											1.12	1.17	1.22	1.26
Average for year	.70	.70	.70	.70	.76	.82	.87	.93	.99	1.05	1.11	1.17	1.23	1.28
Athens-Rosecrans, Dominguez:														
Jan. 1											1.01	1.05	1.09	1.13
Mar. 11											1.14	1.19	1.24	1.29
Sept. 15											1.12	1.17	1.22	1.27
Average for year											1.11	1.16	1.21	1.25
Whittier-La Habra, Coyote Hills: [3]														
Jan. 1	.70	.70	.70	.70	.75	.80	.84	.88	.91	.94	.97	1.00	1.04	1.08
Mar. 11					.76	.82	.87	.93	.98	1.04	1.10	1.16	1.23	1.30
Sept. 15											1.08	1.12	1.16	1.21
Average for year	.70	.70	.70	.70	.76	.82	.86	.92	.97	1.02	1.07	1.12	1.17	1.23
Montebello:														
Jan. 1	.70	.70	.70	.70	.70	.75	.80	.85	.90	.95	.98	1.01	1.04	1.07
Mar. 11					.71	.77	.83	.90	.97	1.05	1.11	1.17	1.23	1.29
Sept. 15											1.08	1.11	1.15	1.19
Average for year	.70	.70	.70	.70	.71	.77	.82	.89	.96	1.03	1.08	1.12	1.17	1.22
Santa Fe Springs:														
Jan. 1								.89	.92	.95	.98	1.01	1.04	1.07
Mar. 11								.92	.95	1.01	1.07	1.13	1.19	1.25
May 17								.50	.50	.50	.50	.50	.50	.50
June 14								.92	.95	1.01	1.07	1.13	1.19	1.25
Sept. 15											1.05	1.09	1.13	1.18
Average for year								.88	.91	.96	1.00	1.05	1.09	1.14

Elwood Terrace:														
Jan. 1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Mar. 11	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Average for year	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Newhall-McKittrick-Kern River:														
Jan. 1	.50	.50	.50	.50	.50	.50	-----	-----	-----	-----	-----	-----	-----	-----
Mar. 11	.55	.55	.55	.55	.55	.55	-----	-----	-----	-----	-----	-----	-----	-----
Average for year	.54	.54	.54	.54	.54	.54	-----	-----	-----	-----	-----	-----	-----	-----
Midway-Sunset-Elk Hills, Buena Vista Hills, Lost Hills:														
Jan. 1	.50	.50	.50	.50	.56	.62	.68	.74	.80	.85	.90	.95	1.00	1.05
Mar. 11	.55	.55	.55	.55	.62	.70	.78	.86	.94	1.02	1.09	1.16	1.23	1.30
Sept. 15	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.06	1.10	1.14	1.18
Average for year	.54	.54	.54	.54	.61	.68	.76	.84	.91	.99	1.05	1.10	1.16	1.22
Coalinga:														
Jan. 1	.50	.50	.50	.50	.56	.62	.68	.74	.80	.85	.88	.91	.94	.98
Mar. 11	.55	.55	.55	.55	.62	.70	.78	.86	.94	1.02	1.07	1.12	1.17	1.23
Sept. 15	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.04	1.06	1.08	1.11
Average for year	.54	.54	.54	.54	.61	.68	.76	.84	.91	.99	1.03	1.06	1.10	1.15
Wheeler Ridge:														
Jan. 1	.50	.50	.50	.50	.56	.62	.68	.74	.80	.85	.88	.91	.94	.97
Mar. 11	.55	.55	.55	.55	.62	.70	.78	.86	.94	1.02	1.07	1.12	1.17	1.22
Sept. 15	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.04	1.06	1.08	1.10
Average for year	.54	.54	.54	.54	.61	.68	.76	.84	.91	.99	1.03	1.06	1.10	1.14
Orcutt:														
Jan. 1	.65	.65	.65	.65	.70	.70	.70	.86	.87	.90	.94	.98	1.02	
Mar. 11	.55	.55	.55	.55	.65	-----	.78	.90	.95	1.02	1.10	1.18	1.26	-----
Sept. 15	-----	-----	-----	-----	.62	-----	-----	.86	.94	-----	1.04	1.06	1.08	1.10
Average for year	.57	.57	.57	.57	.62	.70	.76	.88	.93	1.00	1.05	1.11	1.16	1.17
Playa del Rey:														
Dec. 18 [4]	-----	-----	-----	-----	-----	-----	.74	.77	.81	.84	.87	.90	-----	-----
Kettleman Hills [5]	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

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[1] Standard Oil Co. of California and Union Oil Co.

[2] Alamitos Heights, Huntington Beach, Long Beach and Seal Beach, 14° to 32.9°; Inglewood, Torrance, 14° to 28.9°; Olinda, Brea Canyon, Richfield, 14° to 30.9°.

[3] Whittier-La Habra, 14° to 22.9°; Coyote Hills, 14° to 30.9°.

[4] First posting.

[5] Standard Oil Co. of California, 55° and above; $1.65 throughout the year. Union Oil Co., Sept. 22, posted 35° to 39°, $1.10; 40° to 44°, $1.20; 45° to 49°, $1.35; 50° to 54°, $1.50; 55° and above, $1.65.

Posted price per barrel of petroleum, at wells in 1930, by grades, with dates of change—Continued

Field and date of change	California—Continued [1]														
	28°–28.9°	29°–29.9°	30°–30.9°	31°–31.9°	32°–32.9°	33°–33.9°	34°–34.9°	35°–35.9°	36°–36.9°	37°–37.9°	38°–38.9°	39°–39.9°	40°–40.9°	41°–41.9°	42° and above
Alamitos Heights, Huntington Beach, Inglewood, Olinda, Brea Canyon, Long Beach, Seal Beach, Torrance, Richfield: [2]															
Jan. 1	$1.17	$1.21	$1.25	$1.30	$1.35	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Mar. 11	1.42	1.46	1.50	1.55	1.60	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Sept. 15	1.30	1.34	1.38	1.43	1.48	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Average for year	1.34	1.38	1.42	1.47	1.51	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Athens-Rosecrans, Dominguez:															
Jan. 1	1.17	1.21	1.25	1.30	1.35	$1.41	$1.47	$1.53	$1.59	$1.65	$1.71	$1.77	$1.83	$1.89	$1.95
Mar. 11	1.34	1.39	1.45	1.51	1.57	1.64	1.71	1.78	1.84	1.90	1.96	2.02	2.08	2.14	2.20
Sept. 15	1.32	1.37	1.42	1.47	1.52	1.57	1.62	1.66	1.72	1.78	1.84	1.90	1.96	2.02	2.08
Average for year	1.30	1.35	1.40	1.46	1.51	1.58	1.64	1.70	1.76	1.82	1.88	1.94	2.00	2.06	2.12
Whittier-La Habra, Coyote Hills: [3]															
Jan. 1	1.12	1.16	1.20	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Mar. 11	1.37	1.41	1.45	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Sept 15	1.25	1.29	1.33	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Average for year	1.29	1.33	1.37	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Montebello:															
Jan. 1	1.10	1.13	1.16	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Mar. 11	1.35	1.38	1.41	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Sept. 15	1.23	1.26	1.29	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Average for year	1.27	1.30	1.33	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Santa Fe Springs:															
Jan. 1	1.10	1.15	1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55	1.60	1.65	-------	-------	-------
Mar. 11	1.31	1.37	1.43	1.49	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	-------	-------	-------
May 17	.56	.62	.68	.74	.80	.85	.90	.95	.95	.95	.95	.95	-------	-------	-------
June 14	1.31	1.37	1.43	1.49	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	-------	-------	-------
Sept. 15	1.23	1.28	1.33	1.38	1.43	1.48	1.53	1.58	1.63	1.68	1.73	1.78	-------	-------	-------
Average for year	1.19	1.24	1.30	1.35	1.41	1.46	1.51	1.56	1.61	1.65	1.70	1.74	-------	-------	-------

Elwood Terrace:															
Jan. 1	--------	--------	--------	--------	--------	--------	1.16	1.22	1.28	1.34	1.40	1.46	1.52	1.58	1.64
Mar. 11	--------	--------	--------	--------	--------	--------	1.32	1.39	1.46	1.53	1.60	1.66	1.72	1.78	1.84
Average for year	--------	--------	--------	--------	--------	--------	1.29	1.36	1.43	1.49	1.56	1.62	1.68	1.74	1.80
Midway-Sunset-Elk Hills, Buena Vista Hills, Lost Hills:															
Jan. 1	1.10	1.16	1.22	1.28	1.34	1.40	1.46	1.52	--------	--------	--------	--------	--------	--------	--------
Mar. 11	1.35	1.41	1.47	1.53	1.59	1.65	1.71	1.77	--------	--------	--------	--------	--------	--------	--------
Sept. 15	1.23	1.29	1.35	1.41	1.47	1.53	1.59	1.65	--------	--------	--------	--------	--------	--------	--------
Average for year	1.27	1.33	1.39	1.45	1.51	1.57	1.63	1.69	--------	--------	--------	--------	--------	--------	--------
Coalinga:															
Jan. 1	1.02	1.06	1.10	1.14	1.18	1.22	1.26	1.30	--------	--------	--------	--------	--------	--------	--------
Mar. 11	1.27	1.31	1.35	1.39	1.43	1.47	1.51	1.55	--------	--------	--------	--------	--------	--------	--------
Sept. 15	1.15	1.19	1.23	1.27	1.31	1.35	1.39	1.43	--------	--------	--------	--------	--------	--------	--------
Average for year	1.19	1.23	1.27	1.31	1.35	1.39	1.43	1.47	--------	--------	--------	--------	--------	--------	--------

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[1] Standard Oil Co. of California and Union Oil Co.

[2] Alamitos Heights, Huntington Beach, Long Beach and Seal Beach, 14° to 32.9°; Inglewood, Torrance, 14° to 28.9°; Olinda, Brea Canyon, Richfield, 14° to 30.9°.

[3] Whittier-La Habra, 14° to 22.9°; Coyote Hills, 14° to 30.9°.

WELLS

On December 31, 1930, there were 331,070 producing oil wells in the United States, an increase of 2,870 over the preceding year. The number of oil wells completed in 1930 totaled 11,640, indicating that the number abandoned in 1930 amounted to nearly 9,000, or about 6,500 less than the number abandoned in 1929. Pennsylvania, with 80,560 producing oil wells at the end of 1930, ranked far ahead of the other States in number of wells; Oklahoma was again second, and Texas displaced Ohio in third place. More than half of the producing oil wells are east of the Mississippi; but in 1930 they produced only 5.1 per cent of the total output, because the wells in the eastern fields average under a barrel a day in output, whereas the wells in the Western States average between 16 and 17 barrels a day.

The average production per well per day was 7.5 barrels in 1930, compared with 8.4 barrels in 1929. This decline resulted chiefly from proration, which reduced the output of the large wells relatively more than in 1929. Texas again led in average production per well per day, with New Mexico second and California third. New Mexico undoubtedly could have ranked first in this respect in 1930 if output in the Hobbs field had not been materially curtailed. During 1930, 21,232 wells were drilled in the United States, of which 11,640 (55 per cent) were oil wells, 2,866 (13 per cent) were gas wells, and 6,726 (32 per cent) were dry holes. (See fig. 60.) These figures indicate increases in the percentages of gas wells and dry holes and a decrease in the percentage of oil wells. Except for 1928, the percentage of dry holes represents the highest total recorded since detailed statistics were first compiled (1908); the percentage of gas wells was the highest since 1915. The increase in the percentage of dry wells in 1930 was undoubtedly due to the fact that drilling in the proved fields was restricted more than wildcatting; the gain in percentage of gas wells was related to the increased demand for gas to supply the large pipe-line systems. Drilling was at its peak in May and June but fell off rapidly in the latter part of the year, with the result that the oil wells completed in December (540) were fewer than in any month in more than 10 years.

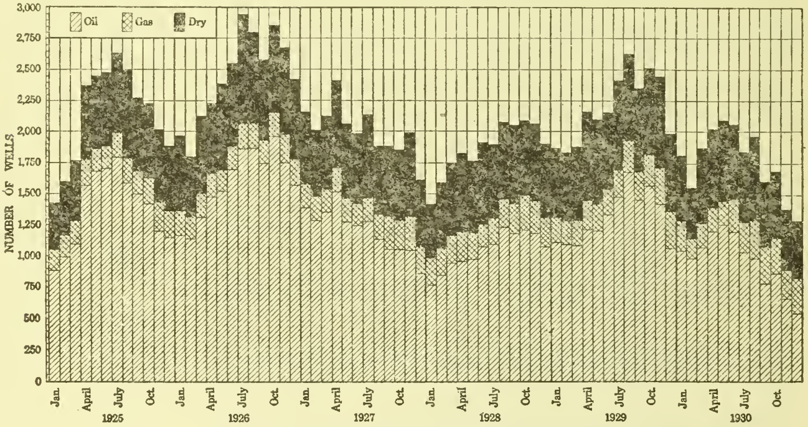

FIGURE 60.—Wells drilled, 1925–1930, by months

In only five States—Indiana, Louisiana, New Mexico, Oklahoma, and Wyoming—did the number of oil wells completed in 1930 increase over 1929. The majority of the other producing States showed material declines in drilling; for example, in Arkansas, Colorado, Illinois, Michigan, and Montana the number of oil wells completed in 1930 was less than half the 1929 total.

A number of fields were developed rapidly in 1930. The most notable of these were Playa del Rey, California, where 163 oil wells were completed in 1930, compared with 1 in 1929; Voshell and Eastborough, Kansas; Lea County (mainly Hobbs), New Mexico, where 154 oil wells were completed in 1930, compared with 19 in 1929; Oklahoma County (mainly Oklahoma City), Oklahoma, where the number of oil wells completed increased from 27 in 1929 to 589 in 1930; Darst Creek, Texas, where 6 oil wells were completed in 1929, compared with 230 in 1930; Van Zandt County (Van), Texas, where 4 wells were completed in 1929 and 171 in 1930; and Weston County (Osage), Wyoming, where 8 wells were completed in 1929 and 45 in 1930. The fields or districts where the number of oil wells completed in 1930 declined materially were Santa Fe Springs and Long Beach, California; Dupo, Illinois; Wright or Sedgwick, Kansas; Ohio County, Kentucky; Muskegon, Michigan; Kevin-Sunburst, Montana; Greater Seminole, Oklahoma; Bradford, Pennsylvania and New York; and north Texas and Salt Flat, Texas. Despite a material decline in development work in 1930 the Bradford field continued to lead in number of oil wells completed. This field probably established a record for consistency in 1930, when no failures and only two gas wells were completed out of a total of 1,583 wells drilled.

Wells drilled for oil and gas in the United States, 1859–1930

Year	Oil		Gas		Dry		Total completed
	Number	Per cent	Number	Per cent	Number	Per cent	
1859–1907 [1]	[2] 232,982	(2)	(2)	(2)	54,940	19	287,922
1908	13,210	78	485	3	3,214	19	16,909
1909	13,875	76	1,048	5	3,404	19	18,327
1910	11,018	74	1,500	10	2,422	16	14,940
1911	9,825	71	1,580	12	2,363	17	13,768
1912	12,514	73	1,811	10	2,855	17	17,180
1913	19,101	75	2,207	8	4,282	17	25,590
1914	16,668	72	2,327	10	4,142	18	23,137
1915	9,154	65	2,022	14	2,981	21	14,157
1916	18,777	76	1,803	8	4,039	16	24,619
1917	16,590	71	1,966	8	4,851	21	23,407
1918	17,845	69	2,229	9	5,613	22	25,687
1919	21,052	72	2,135	7	5,986	21	29,173
1920	24,273	71	2,274	7	7,364	22	33,911
1921	14,666	67	2,111	9	5,160	24	21,937
1922	17,333	70	2,024	8	5,332	22	24,689
1923	16,206	66	2,349	10	5,883	24	24,438
1924	14,587	67	2,257	10	5,044	23	21,888
1925	16,559	65	2,330	9	6,734	26	25,623
1926	19,013	65	2,341	8	7,965	27	29,319
1927	14,442	60	2,491	10	7,210	30	24,143
1928	12,526	56	2,727	12	7,078	32	22,331
1929	15,572	59	2,870	11	7,914	30	26,356
1930	11,640	55	2,866	13	6,726	32	21,232
	[2] 589,428	(2)	[2] 47,753	(2)	173,502	21	810,683

[1] Day, D. T., The Petroleum Resources of the United States: Papers on the Conservation of Mineral Resources: U. S. Geol. Survey Bull. 394, 1909, pp. 30–50.

[2] Gas wells, 1859–1907, included with oil wells.

Approximate number of producing oil wells in the United States, December 31, 1928–1930

State	1928		1929		1930	
	Approximate number of wells	Average production per well per day (barrels)	Approximate number of wells	Average production per well per day (barrels)	Approximate number of wells	Average production per well per day (barrels)
Arkansas	4,520	19.3	3,900	16.2	3,850	13.9
California [1]	[1] 10,710	57.6	[1] 10,520	75.5	[1] 9,450	62.4
Colorado	210	39.9	220	30.0	240	19.7
Illinois	16,340	1.1	16,000	1.1	15,800	1.0
Indiana:						
Southwestern	1,140	2.3	1,130	2.2	1,140	2.3
Northeastern	900	.3	820	.2	600	.2
Total Indiana	2,040	1.4	1,950	1.3	1,740	1.5
Kansas	19,800	5.4	20,080	5.9	20,120	5.7
Kentucky	13,740	1.5	14,650	1.5	14,400	1.4
Louisiana:						
Gulf coast	320	67.6	360	60.1	370	64.6
Northern	3,500	10.8	3,420	10.4	3,560	11.5
Total Louisiana	3,820	14.8	3,780	14.8	3,930	16.5
Michigan	400	4.6	500	27.6	640	18.8
Montana	1,100	10.5	1,290	9.1	1,410	6.8
New Mexico	260	10.1	270	18.9	460	76.5
New York	16,500	.4	16,800	.6	17,100	.6
Ohio:						
Central and eastern	20,950	.7	20,720	.7	20,710	.7
Northwestern	16,950	.3	16,490	.2	15,820	.2
Total Ohio	37,900	.5	37,210	.5	36,530	.5
Oklahoma	62,900	11.0	61,180	11.3	63,600	9.5
Pennsylvania	78,600	.3	80,320	.4	80,560	.4
Texas:						
Gulf coast	2,850	39.9	2,910	47.2	2,840	58.2
West Texas	2,040	208.9	2,490	161.3	2,910	110.3
Rest of State	30,860	8.7	30,880	10.1	32,310	10.5
Total Texas	35,750	20.8	36,280	22.6	38,060	21.4
West Virginia	19,600	.8	19,650	.8	19,600	.7
Wyoming	3,520	16.6	3,530	15.0	3,520	13.9
Other	[2] 90		[2] 70		[2] 60	
United States	327,800	7.6	328,200	8.4	331,070	7.5

[1] American Petroleum Institute; does not include wells temporarily shut in.
[2] Alaska, Tennessee, and Utah.

Wells drilled for oil and gas in the United States, 1930, by months [1]

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The year	
													Total	Percentage
Oil	1,055	976	1,080	1,209	1,249	1,197	1,042	988	781	866	657	540	11,640	55
Gas	231	173	184	193	205	274	232	297	289	282	231	275	2,866	13
Dry	526	410	606	612	655	603	572	681	542	548	494	477	6,726	32
	1,812	1,559	1,870	2,014	2,109	2,074	1,846	1,966	1,612	1,696	1,382	1,292	21,232	100

[1] California dry gas wells not reported.

Wells drilled for oil and gas in the United States in 1930, by States and by counties or districts [1]

State and county or district	Oil	Gas	Dry	Total	Estimated average initial daily production per well (barrels)
Arkansas:					
Miller	1		1	2	100
Ouachita	17		11	28	38
Union	28	1	27	56	195
Miscellaneous		11	30	41	
	46	12	69	127	135
Total, 1929	103	19	123	245	190
California:					
Capitan	7	(2)	3	10	160
Coalinga	1			1	10
Coyote	6		1	7	466
Elk Hills	1		3	4	400
Elwood-Goleta	31		2	33	3,946
Fruitvale	7		6	13	343
Fullerton	1			1	50
Huntington Beach	10		5	15	96
Inglewood	5		1	6	227
Kern River	17		3	20	199
Kettleman Hills	6		3	9	3,651
Long Beach	142		17	159	636
Lost Hills-Belridge	5		1	6	16
McKittrick	3			3	35
Midway-Sunset	68		11	79	495
Montebello	1		1	2	241
Mount Poso	24		3	27	127
Playa del Rey	163		8	171	638
Potrero	14		7	21	491
Richfield	10		2	12	180
Rincon	5		3	8	292
Rosecrans	6		4	10	479
Round Mountain	20		3	23	247
Santa Barbara	2		5	7	575
Santa Fe Springs	148		6	154	837
Santa Maria	1		5	6	275
Seal Beach	2			2	283
Summerland	3		2	5	75
Ventura Avenue	36		2	38	1,431
Ventura-Newhall	10		24	34	97
Miscellaneous			123	123	
	755	(2)	254	1,009	774
Total, 1929	910	(2)	314	1,224	1,437
Colorado:					
Fremont	7		15	22	63
Larimer	2	1	2	5	15
Moffat	3	3	2	8	164
Miscellaneous	1	6	15	22	2
	13	10	34	57	75
Total, 1929	33	5	60	98	148
Illinois:					
Crawford	38	2	18	58	13
Lawrence	13		9	22	40
Madison	1		2	3	12
Marion	2			2	8
Monroe	3		7	10	4
St. Clair	34		23	57	45
Wabash	19	1	13	33	24
Miscellaneous	7		12	19	2
	117	3	84	204	26
Total, 1929	314	2	87	403	51
Indiana:					
Northeastern—					
Adams	3		2	5	12
Jay	4	1	1	6	18
Miscellaneous	2	15	5	22	9
	9	16	8	33	14
Total, 1929	10	8	5	23	15

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[1] For States east of California, Oil and Gas Journal; for California, American Petroleum Institute.

[2] California dry gas wells not reported.

Wells drilled for oil and gas in the United States in 1930, by States and by counties or districts—Continued

State and county or district	Oil	Gas	Dry	Total	Estimated average initial daily production per well (barrels)
Indiana—Continued.					
Southwestern—					
Daviess	3	2	4	9	10
Gibson	6	3	7	16	29
Perry	10	3	8	21	7
Pike	32	20	17	69	37
Spencer	6		7	13	32
Sullivan	2	3	6	11	33
Vigo	12		2	14	55
Miscellaneous	1	8	20	29	2
	72	39	71	182	33
Total, 1929	57	28	73	158	29
Total Indiana, 1930	81	55	79	215	31
1929	67	36	78	181	27
Kansas:					
Barton	1		2	3	250
Butler	37		51	88	120
Chase	3		9	12	22
Coffey	8	1	18	27	46
Cowley	23	21	25	69	126
Edwards	1	2	1	4	240
Elk	5	2	14	21	190
Ellis	12		11	23	212
Ellsworth	1		2	3	359
Greenwood	93	4	46	143	139
Harvey	2		13	15	137
McPherson	139	10	29	178	1,088
Marion	7	1	12	20	104
Reno	1	2	12	15	292
Rice	10	2	20	32	898
Rooks	2		2	4	170
Russell	12		9	21	103
Sedgwick	59	1	37	97	610
Stafford	1		3	4	346
Sumner	19	1	18	38	177
Woodson	5	2	5	12	30
Miscellaneous	4	119	84	207	80
	445	168	423	1,036	513
Total, 1929	553	52	453	1,058	299
Kentucky:					
Allen	1			1	200
Daviess	107	9	62	178	40
Hancock	22	11	5	38	36
Hart	59	13	16	88	282
Henderson	69	14	39	122	17
Lee-Owsley	9			9	11
McLean	32	2	23	57	52
Muhlenberg	6	5	2	13	70
Ohio	243	62	122	427	49
Warren	11		14	25	10
Miscellaneous	74	41	37	152	7
	633	157	320	1,110	60
Total, 1929	897	82	405	1,384	56
Louisiana:					
Gulf coast—					
Bayou Bleu	6		2	8	150
Bayou Bouillon	2		3	5	1,240
Edgerley	6		9	15	49
Hackberry	25		22	47	829
Jennings	8		8	16	312
Lockport	13		2	15	430
Port Barre	10		5	15	975
Sorrento	2		2	4	350
Starks	8		3	11	178
Sulphur	16		5	21	1,564
Sweet Lake	2		1	3	825
Vinton	26		6	32	986
Miscellaneous	10	1	93	104	793
	134	1	161	296	781
Total, 1929	155	6	192	353	527

Wells drilled for oil and gas in the United States in 1930, by States and by counties or districts—Continued

State and county or district	Oil	Gas	Dry	Total	Estimated average initial daily production per well (barrels)
Louisiana—Continued.					
Northern—					
Bossier	73	23	53	149	171
Caddo	46	7	18	71	55
La Salle	7		7	14	36
Sabine	59	6	90	155	525
Webster	22	3	15	40	57
Miscellaneous	6	215	96	317	1,299
	213	254	279	746	259
Total, 1929	147	281	184	612	201
Total Louisiana, 1930	347	255	440	1,042	461
1929	302	287	376	965	368
Michigan:					
Cass	2		4	6	15
Gratiot	1		4	5	250
Isabella	103	11	29	143	184
Midland	19		4	23	289
Monroe	2		2	4	58
Muskegon	20	7	7	34	43
Saginaw	3		3	6	22
Shiawassee	1			1	10
Miscellaneous		11	62	73	
	151	29	115	295	170
Total, 1929	348	31	124	503	368
Montana:					
Bannatyne	4		1	5	10
Border	16	1	7	24	136
Carbon County	1		1	2	1,500
Kevin-Sunburst	44	12	30	86	29
Pondera	8			8	96
Sweetgrass	1			1	38
Miscellaneous		27	29	56	
	74	40	68	182	78
Total, 1929	213	66	94	373	56
New Mexico:					
Eddy	8	6	11	25	68
Lea	154	2	15	171	7,135
Miscellaneous		3	10	13	
	162	11	36	209	6,786
Total, 1929	32	16	71	119	408
Ohio:					
Central and eastern—					
Ashland	49	45	66	160	7
Athens	32	77	52	161	8
Belmont	7	16	11	34	13
Coshocton	25	21	9	55	41
Guernsey	69	8	17	94	42
Hocking	12	1	3	16	31
Holmes	24	20	24	68	47
Knox	16	31	23	70	27
Licking	133	19	29	181	56
Medina	66	24	41	131	15
Muskingum	115	89	55	259	75
Perry	52	20	24	96	61
Tuscarawas	27	32	12	71	67
Washington	52	4	26	82	5
Miscellaneous	136	174	141	451	5
	815	581	533	1,929	36
Total, 1929	1,009	776	594	2,379	27

Wells drilled for oil and gas in the United States in 1930, by States and by counties or districts—Continued

State and county or district	Oil	Gas	Dry	Total	Estimated average initial daily production per well (barrels)
Ohio—Contiuued.					
Northwestern—					
Allen	14			14	24
Hancock	15	3	3	21	36
Hardin	12	36	3	51	18
Lucas	8			8	19
Seneca	16	10	19	45	14
Miscellaneous	29	23	14	66	7
	94	72	39	205	18
Total, 1929	126	25	40	191	30
Total Ohio, 1930	909	653	572	2,134	34
1929	1,135	801	634	2,570	27
Oklahoma:					
Beckham	1	3	2	6	100
Caddo	32	7	15	54	348
Carter	76	1	20	97	597
Cleveland	2		6	8	19,257
Cotton	68	1	17	86	75
Creek	122	38	84	244	85
Garfield	4	2	5	11	425
Hughes	9	22	21	52	214
Jefferson	17		5	22	112
Kay	8	10	12	30	56
Lincoln	13	6	22	41	1,955
Logan	11	1	7	19	643
Marshall	58		44	102	70
Muskogee	51	49	123	223	72
Noble	3	5	6	14	133
Okfuskee	49	16	38	103	71
Oklahoma	589	23	16	628	8,107
Osage	100	28	62	190	91
Pawnee	50	11	37	98	66
Payne	27	5	19	51	378
Pontotoc	65	1	15	81	121
Pottawatomie	147	3	27	177	755
Seminole	424	38	124	586	1,280
Stephens	47	8	53	108	102
Tulsa	14	4	32	50	176
Miscellaneous	74	121	190	385	19
	2,061	403	1,002	3,466	2,731
Total, 1929	1,999	369	1,245	3,613	590
Pennsylvania and New York:					
Allegany	211	2	6	219	2
Bradford	1,581	2		1,583	1
Butler-Armstrong	46	17	23	86	2
Middle Field	42	4	2	48	2
Venango-Clarion	134	37	31	202	1
Southwestern Pennsylvania	69	67	49	185	7
	2,083	129	111	2,323	2
Total, 1929	3,790	116	103	4,009	2
Texas:					
Gulf coast—					
Barbers Hill	118		13	131	782
Batson	17		11	28	20
Big Creek	6		7	13	620
Blue Ridge	11		6	17	212
Boling	4		4	8	40
Clay Creek	8	1	8	17	269
Damon Mound	1		4	5	500
De Walt (Sugarland)	14	1		15	608
Esperson	31	1	6	38	396
Fannette	2		6	8	200
Goose Creek	5		8	13	100
Hankamer	9		2	11	861
High Island	5	1	1	7	1,308
Hull	41	1	6	48	409
Humble	75	1	19	95	836
Liberty	14		10	24	106
Lost Lake	4		4	8	318

Wells drilled for oil and gas in the United States in 1930, by States and by counties or districts—Continued

State and county or district	Oil	Gas	Dry	Total	Estimated average initial daily production per well (barrels)
Texas—Continued.					
Gulf coast—Continued.					
Markham	2			2	103
North Dayton	9		7	16	820
Orange	10		2	12	164
Orchard	7			7	890
Pierce Junction	33	1	11	45	793
Port Neches	3		1	4	913
Raccoon Bend	36	1	11	48	279
Refugio	133	26	36	195	462
Saratoga	20	1	7	28	34
Sourlake	10		5	15	49
Spindletop	45	4	22	71	563
West Columbia	4		2	6	380
Miscellaneous	9	4	117	130	766
	686	43	336	1,065	540
Total, 1929	866	58	456	1,380	603
Rest of State—					
North, central, eastern, and southwestern—					
Anderson	2	5	14	21	1,156
Archer	190		232	422	55
Baylor	20		28	48	159
Brown	51	12	131	194	57
Buchanan	4		3	7	234
Chapman	31		15	46	390
Clay	6	1	18	25	34
Coleman	55	17	106	178	87
Cooke	30		56	86	44
Darst Creek	230		45	275	1,386
Eastland	31	25	52	108	67
Foard	1	1	3	5	79
Grayson	2		9	11	30
Jack	30	3	19	52	102
Limestone	3		11	14	24
Mirando	176	46	125	347	131
Montague	28	1	19	48	61
Palo Pinto	14	16	23	53	27
Pettus	35	9	24	68	582
Rusk	3		5	8	5,187
Salt Flat (Bruner)	12			12	1,233
Shackelford	44	3	86	133	55
Stephens	27	18	22	67	148
Van Zandt	171	1	27	199	3,617
White Point	1	1		2	100
Wichita	129		80	209	58
Wilbarger	115		56	171	116
Young	356	3	516	875	227
Miscellaneous	123	101	551	775	334
	1,920	263	2,276	4,459	628
Total, 1929	2,508	370	2,620	5,498	158
Panhandle—					
Carson	35	36	8	79	219
Gray	246	30	30	306	650
Hutchinson	53	17	8	78	174
Moore	4	9	2	15	271
Wheeler	5	73	11	89	187
Miscellaneous		7	13	20	
	343	172	72	587	522
Total, 1929	351	139	70	560	795
West Texas—					
Andrews	4		3	7	108
Crane	45		3	48	324
Crockett	7		6	13	149
Ector	77	1	7	85	646
Fisher	4		7	11	436
Glasscock	35		6	41	912
Howard	65		8	73	207
Irion	6		12	18	78
Loving	16		3	19	368
Mitchell	4		6	10	140

Wells drilled for oil and gas in the United States in 1930, by States and by counties or districts—Continued

State and county or district	Oil	Gas	Dry	Total	Estimated average initial daily production per wel. (barrels)
Texas—Continued.					
Rest of State—Continued.					
West Texas—Continued.					
Pecos	141	3	70	214	1,261
Reagan	10	----------	3	13	649
Runnels	1	----------	3	4	186
Taylor	4	1	4	9	78
Upton	20	----------	4	24	260
Ward	33	----------	15	48	182
Winkler	17	----------	3	20	2,405
Miscellaneous	6	----------	70	76	171
	495	5	233	733	723
Total, 1929	715	12	389	1,116	2,638
Total "Rest of State," 1930	2,758	440	2,581	5,779	632
1929	3,574	521	3,079	7,174	717
Total Texas, 1930	3,444	483	2,917	6,844	613
1929	4,440	579	3,535	8,554	695
West Virginia:					
Boone	16	68	5	89	12
Clay	22	10	1	33	17
Gilmer	13	20	12	45	9
Hancock	6	----------	2	8	5
Jackson	7	----------	4	11	10
Kanawha	7	30	3	40	8
Mingo	2	7	3	12	17
Ritchie	23	23	19	65	13
Roane	25	28	4	57	23
Wetzel-Tyler	8	21	13	42	12
Miscellaneous	89	190	70	349	3
	218	397	136	751	10
Total, 1929	350	399	132	881	11
Wyoming:					
Big Horn	2	2	1	5	1,750
Carbon	2	1	6	9	98
Fremont	4	3	2	9	101
Hot Springs	1	----------	2	3	193
Natrona—Salt Creek	14	----------	----------	14	456
Natrona (other than Salt Creek)	10	1	1	12	53
Niobrara	2	----------	1	3	375
Park	11	3	5	19	252
Sublette	8	----------	----------	8	57
Sweetwater	1	7	1	9	1,250
Weston	45	----------	10	55	169
Miscellaneous	----------	----------	6	6	----------
	100	17	35	152	241
Total, 1929	82	9	44	135	425
Other States, 1930 [3]	1	44	31	76	100
1929 [3]	4	1	36	41	30
United States, 1930	11,640	[2] 2,866	6,726	[2] 21,232	855
1929	15,572	[2] 2,870	7,914	[2] 26,356	396

[2] California dry gas wells not reported.

[3] 1929, Alabama, Mississippi, Tennessee, and Utah; 1930, Mississippi, Tennessee, and Utah.

GRAVITY OF CRUDE PETROLEUM

The gravity of the various grades of crude oil produced in the United States had the same range in 1930 as in 1929; that is, from a low of 6.8° A. P. I. for the crude from the Casmalia field, California, to 65° A. P. I. for the crude from the Rattlesnake field, New Mexico. A recent (November, 1931) completion in the Kettleman Hills field, California, is reported to be producing oil of 66° gravity. However, the average gravity of the crude produced in that field was probably considerably below 60° A. P. I., the gravity of oil from the first producers, because the major portion of the output in 1930 came from a deeper zone containing oil of about 38° gravity.

In the chapter of this series for 1929 (p. 513) there is a statement that the average gravity of the crude produced in 1929 was probably higher than that produced in 1928. A recent brief survey of gravities has shown that the average gravity in 1929 was the same as in 1928—that is, 32.2° A. P. I.—but that the average increased to 32.4° A. P. I. in 1930. In 1929 the increase in production of Santa Fe Springs, which produces a comparatively light crude, was compensated by a gain in output in the west Texas district, which produces an oil of lower gravity (approximately 31.0° A. P. I.). In 1930 the average gravity increased because the relative importance of California, the crude of which has a relatively low average gravity, was reduced by a decline in output.

Estimated average gravity of crude petroleum from various fields in the United States in 1930

District or grade	Degrees A. P. I.	Specific gravity
Alaska: Katalla	44.0	0.806
Arkansas:		
Bradley	26.4	.896
Champagnolle	29.5	.879
El Dorado	34.4	.853
Irma	14.4	.970
Lisbon	34.0	.855
Mount Holly	29.0	.882
Smackover—		
Heavy	19.8	.935
Light	25.9	.899
Stephens	29.0	.882
Urbana	17.5	.950
California:		
Casmalia	6.8	1.023
Cat Canyon	15.9	.960
Coalinga	19.4	.938
Coyote	25.0	.904
Dominguez	31.0	.871
Elk Hills	22.5	.919
Elwood	37.5	.837
Fruitvale	23.7	.912
Fullerton	22.4	.919
Huntington Beach	25.6	.901
Inglewood	18.4	.944
Kern River	14.1	.972
Kettleman Hills—		
Heavy	38.0	.835
Light	60.0	.739
Lawndale	35.0	.850
Long Beach	25.8	.900
Los Angeles	15.5	.963
Lost Hills-Belridge	25.5	.901
McKittrick	14.8	.967
Midway-Sunset	19.0	.940
Montebello	23.0	.916
Mount Poso	15.5	.963
Newhall	22.0	.922
Playa del Rey	22.5	.919
Potrero	48.5	.786
Richfield	22.3	.920
Rincon	30.0	.876
Rosecrans	37.8	.836
Round Mountain	18.2	.945
Salt Lake	14.8	.967
Santa Fe Springs	33.2	.859
Santa Maria	23.0	.916
Seal Beach	24.2	.909
South Mountain	28.2	.886
Summerland	13.6	.975
Torrance	20.7	.930
Ventura Avenue	30.2	.875
Wheeler Ridge	25.3	.902
Whittier	19.1	.940
Colorado:		
Canon City	32.0	0.865
Florence	29.3	.880
Fort Collins	37.0	.840
Greasewood	42.0	.816
Iles Dome	35.0	.850
Moffat	41.0	.820
Rangely	42.5	.813
Tow Creek	35.0	.850
Walden	51.0	.775
Illinois:		
Dupo	30.0	.876
"Illinois"	31.5	.868
Plymouth	34.2	.854
Waterloo	30.0	.876
Indiana:		
Northeastern ("Indiana")	35.5	.847
Southwestern ("Princeton")	33.0	.860
Kansas:		
Anderson County	35.0	.850
Augusta	34.0	.855
Big Sandy	23.0	.916
Churchill	36.0	.845
Eastborough	42.0	.816
Eldorado	36.0	.845
Hays	31.0	.871
Iola	19.0	.940
Leon-Weaver	34.0	.855
Lost Springs	37.0	.840
Rainbow Bend	39.0	.830
Ritz	34.0	.855
Russell County	39.0	.830
Seely	40.0	.825
Sumner County	38.0	.835
Teeter	36.8	.841
Virgil	38.0	.835
Voshell	41.5	.818
Winfield-New Salem	38.0	.835
Wright	42.5	.813
Kentucky:		
Daviess County	35.8	.846
Hart County	35.0	.850
Ohio County	35.0	.850
Ragland	23.2	.915
Rodemer	29.0	.882
Scottsville	35.0	.850
Somerset	37.6	.837
Warren County	36.0	.845
Wayne	37.6	.837
Louisiana:		
Gulf coast (salt domes)—		
Anse la Butte	24.0	.910
Bayou Bleu	21.8	.923

Estimated average gravity of crude petroleum from various fields in the United States in 1930—Continued

District or grade	Degrees A. P. I.	Specific gravity
Louisiana—Continued.		
Gulf coast (salt domes)—Continued.		
Bayou Bouillon	30.2	0.875
Black Bayou	24.0	.910
Caillou Island	27.0	.893
Dog Lake	24.0	.910
Edgerley	21.0	.928
Hackberry	21.0	.928
Jennings	24.3	.908
Lake Barre	28.0	.887
Lake Pelto	17.0	.953
Lockport	24.8	.905
Port Barre	26.0	.898
Sorrento	26.2	.897
Starks	21.0	.928
Sulphur—		
Heavy	22.3	.920
Light	26.3	.897
Sweet Lake	29.5	.879
Vinton	18.6	.943
Welsh	22.0	.922
White Castle	28.0	.887
Rest of State—		
Bellevue	19.0	.940
Caddo—		
Heavy	26.5	.896
Light	40.1	.825
Carterville	40.0	.825
Cotton Valley	29.0	.882
De Soto	36.0	.845
Elm Grove	29.5	.879
Haynesville	35.0	.850
Holly	37.3	.838
Homer	36.2	.844
Pleasant Hill	39.6	.827
Red River	39.5	.828
Sarepta	43.0	.811
Urania	21.0	.928
Zwolle	39.6	.827
Michigan:		
Mount Pleasant	43.0	.811
Muskegon	38.4	.833
Saginaw	40.0	.825
Montana:		
Bannatyne	27.0	.893
Border	31.0	.871
Cat Creek	49.7	.781
Dry Creek	52.0	.771
Elk Basin	42.0	.816
Kevin-Sunburst	31.9	.866
Lake Basin	44.0	.806
Pondera	34.0	.855
New Mexico:		
Artesia	37.0	.840
Hobbs	35.0	.850
Hogback	56.0	.755
Hospah	30.0	.876
Maljamar	33.0	.860
Rattlesnake	65.0	.720
Table Mesa	57.0	.751
New York	43.5	.809
Ohio:		
Northwestern ("Lima")	36.6	.842
Southeastern and central—		
Cleveland	38.2	.834
Corning	40.0	.825
Pennsylvania grade	42.5	.813
Wooster	38.1	.834
Oklahoma:		
Allen	29.7	.878
Asher-Wanette	39.0	.830
Bowlegs	39.5	.828
Braman	41.0	.820
Bristow	34.0	.855
Burbank	37.6	.837
Cement	34.6	.852
Cromwell	38.0	.835
Cushing	39.4	.828
Davenport	43.2	.810
Oklahoma—Continued.		
Duncan	35.4	0.848
Earlsboro	40.0	.825
Fox	23.6	.912
Garber	45.6	.799
Glenn	34.0	.855
Graham	38.0	.835
Healdton	30.0	.876
Hewitt	33.5	.858
Konawa	36.0	.845
Little River	38.0	.832
Lovell-Marshall	40.5	.825
Oklahoma City	38.5	.835
Papoose	38.0	.835
St. Louis	40.0	.824
Sasakwa	36.0	.840
Searight	38.2	.835
Seminole City	39.0	.836
Sholem-Alechem	32.0	.866
Thomas	42.0	.819
Tonkawa	42.0	.812
Walters	33.3	.854
Wewoka	38.5	.833
Wheeler	21.7	.925
Pennsylvania:		
Bradford	43.5	.809
Franklin	29.5	.879
"Pennsylvania"	40.0	.825
Tennessee:		
Glen Mary	39.0	.830
Tinsleys Bottom	43.2	.810
Texas:		
Gulf coast (salt domes)—		
Allen	40.0	.825
Barbers Hill	26.2	.897
Batson	20.6	.930
Big Creek	27.0	.893
Blue Ridge	30.0	.878
Boling	29.1	.816
Clay Creek	25.5	.901
Corpus Christi	23.0	.916
Damon Mound	22.1	.921
Dayton	30.0	.876
Esperson	21.7	.924
Fannette	31.8	.867
Goose Creek	24.0	.910
Hankamer	24.3	.908
High Island	28.0	.887
Hull	25.0	.904
Humble	19.4	.938
Kingsville	21.5	.925
Lost Lake	21.0	.928
Markham	26.3	.897
Moore	34.5	.852
Moss Bluff	26.4	.896
Mykawa	27.0	.893
Nash	20.0	.934
Orange	23.7	.912
Pierce Junction	23.5	.913
Port Neches	21.5	.925
Raccoon Bend	25.5	.901
Refugio—		
Heavy	23.0	.916
Light	60.0	.739
Saratoga	19.0	.940
Sourlake	26.0	.898
South Liberty	22.3	.920
Spindletop	26.0	.898
Sugarland	28.0	.887
West Columbia	22.8	.917
Rest of State—		
East and south-central—		
Boggy Creek	39.0	.830
Calliham	18.0	.947
Chapman	36.0	.845
Currie	42.0	.816
Darst Creek	35.5	.847
East Texas	38.5	.832
Luling	26.8	.894
Lytton Springs	38.0	.835

Estimated average gravity of crude petroleum from various fields in the United States in 1930—Continued

District or grade	Degrees A. P. I.	Specific gravity
Texas—Continued.		
Rest of State—Continued.		
East and south-central—Continued.		
Manford	37.0	0.840
Mexia	35.6	.847
Minerva	38.5	.832
Pettus	45.0	.802
Powell	37.5	.837
Salt Flat (Bruner)	35.0	.850
Somerset	34.0	.855
Thrall	37.6	.837
Van	34.0	.855
Wortham	38.5	.832
North and central—		
Brownwood	34.0	.855
Burkburnett	37.4	.838
Cooke County	40.7	.822
Desdemona	37.2	.839
Electra	40.2	.824
Nocona	22.0	.922
Noodle Creek	40.5	.823
Petrolia	36.8	.841
Ranger	37.0	.840
Riggs	40.0	.825
Runnels	43.5	.809
Panhandle	35.8	.846
Southwest—		
Albercas	23.0	.916
Bruni	18.0	.947
Hondo	19.0	.940
Mirando	23.0	.916
Randado	21.0	.928
West Texas—		
Big Lake	38.2	.834
Chalk	31.3	.869
Church-Fields	31.0	.871
Ector	33.5	.858
Hendricks	30.0	.876
Loving	39.0	.830
McCamey	28.0	.887
Texas—Continued.		
Rest of State—Continued.		
West Texas—Continued.		
McElroy	32.0	0.865
Penn	33.5	.858
Taylor-Link	30.0	.876
Ward	35.0	.850
Westbrook	25.0	.904
World	29.7	.878
Yates	30.0	.876
West Virginia:		
Cabin Creek	47.0	.793
Kelleys Creek	45.6	.799
"Pennsylvania"	42.7	.812
Somerset	39.4	.828
Wyoming:		
Badger Basin	45.0	.802
Big Muddy	32.4	.863
Dutton Creek	33.6	.857
Elk Basin	42.0	.816
Ferris	36.6	.842
Frannie—		
Heavy	17.0	.953
Light	28.0	.887
Grass Creek	44.0	.806
Greybull	44.7	.803
Hamilton Dome	25.2	.903
La Barge	30.0	.876
Lance Creek	40.4	.823
Lander	23.4	.914
Lost Soldier	30.2	.875
Mahoney	33.0	.860
Midway	28.5	.884
Mule Creek	31.7	.867
Oregon Basin	22.0	.922
Osage	37.6	.837
Pilot Butte	35.4	.848
Rex Lake	32.3	.864
Rock Creek	36.4	.843
Salt Creek	36.8	.841
Tensleep	37.0	.840

PRODUCTION OF PETROLEUM AND ROYALTIES FROM WELLS UNDER FEDERAL CONTROL

The production of crude petroleum on Government lands, after declining steadily since 1924, increased from 31,683,687.07 barrels in 1929 to 33,449,606.86 barrels in 1930. This increase was due primarily to gains in California and New Mexico, which more than offset the decrease in Wyoming. Although the total production on Government lands increased in 1930 the royalty oil fell to 4,331,835.71 barrels from 4,526,903.99 barrels in 1929. This anomalous condition was due to the fact that the decrease in the average royalty (percentage) assessed in 1930 more than offset the gain in total production. For example, the average royalty declined from 14.3 per cent in 1929 to 13 per cent in 1930. This decrease is due largely to the increase in production on Government lands in New Mexico where the royalty is low—6.1 per cent in 1930. The total value of the royalty oil in 1930 amounted to $4,776,943.58, or an average of $1.10 per barrel. This average represents a decline of only 1 cent per barrel from the average for 1929, or considerably less than the decline in the average value for the country as a whole.

Although the acreage of Indian lands leased for oil and gas increased in 1930 for the first time since 1928 the bonus from the sale of leases and the royalty from production continued to decline. A total of 197,201 acres of Indian lands was leased in 1930, an increase of 37 per cent over 1929. This gain resulted largely from increases in leasing of land belonging to the Five Civilized Tribes (Oklahoma) and the Kiowas (Kansas). Oklahoma was credited with 98 per cent of all the bonus and royalty money paid in 1930 from operations on Indian lands.

Crude petroleum produced on Government lands, 1929 and 1930, under the operation of the leasing act of February 25, 1920

[From U. S. Geological Survey]

State and land office	1929			1930		
	Production (barrels)	Royalty		Production (barrels)	Royalty	
		Barrels	Value		Barrels	Value
California:						
Los Angeles	1,795,505.38	219,831.26	$198,751.80	3,835,027.97	290,581.99	$257,592.73
Sacramento (including Visalia), outside naval reserves	6,267,912.18	702,742.50	590,544.93	7,109,216.66	703,711.57	637,241.83
Sacramento (including Visalia), inside naval reserves	7,443,647.34	1,615,922.05	1,380,594.52	6,522,626.73	1,476,096.23	1,410,827.04
	15,507,064.90	2,538,495.81	2,169,891.25	17,466,871.36	2,470,389.79	2,305,661.60
Colorado: Denver	852,796.12	57,739.23	43,499.66	659,928.26	44,893.44	32,854.34
Louisiana: Baton Rouge	7,409.21	757.40	1,572.87	12,009.34	922.75	1,650.59
Montana:						
Billings	405,941.62	23,490.24	57,724.89	342,250.15	19,559.95	45,961.22
Great Falls	150,209.51	9,392.91	17,182.72	119,657.98	6,793.54	11,814.77
	556,151.13	32,883.15	74,907.61	461,908.13	26,353.49	57,775.99
New Mexico:						
Las Cruces	496,735.68	62,876.43	62,138.76	1,724,120.94	105,590.18	94,244.97
Santa Fe	957.10	191.42	258.13	316.50	63.30	137.04
	497,692.78	63,067.85	62,396.89	1,724,437.44	105,653.48	94,382.01
Oklahoma: Guthrie	426,589.24	57,802.61	96,013.21	499,796.98	66,681.98	102,260.91
Utah: Salt Lake City	3,279.85	367.84	473.20	3,212.01	216.54	273.42
Wyoming:						
Buffalo	80,475.54	6,145.99	9,127.13	74,433.38	5,157.94	8,014.60
Cheyenne, outside naval reserves	12,943,077.24	1,698,874.97	2,519,889.92	11,783,954.48	1,550,418.03	2,126,601.10
Evanston	808,151.06	70,769.14	65,166.95	763,055.48	61,148.27	47,469.02
	13,831,703.84	1,775,790.10	2,594,184.00	12,621,443.34	1,616,724.24	2,182,084.72
	31,682,687.07	4,526,903.99	5,042,938.69	33,449,606.86	4,331,835.71	4,776,943.58

Royalty receipts from production of oil and gas and bonuses paid for sale of leases on Indian reservations, fiscal years ended June 30, 1929 and 1930

[From Office of Indian Affairs]

Reservation	1929			1930		
	Oil and gas land leased during year (acres)	Receipts		Oil and gas land leased during year (acres)	Receipts	
		Bonus from sale of leases	Royalty from production		Bonus from sale of leases	Royalty from production
Five Civilized Tribes:						
Oil	57,797	$207,648	$4,350,108	101,778	$734,093	$4,415,357
Gas						266,116
Blackfeet	3,330	25		3,257	529	
Cheyenne and Arapho: Oil	15,263	69,809		2,549	12,270	
Chippewa				40	27,600	14,926
Crow	12,488	380				
Kiowa:						
Oil	674		53,875	58,350	130,962	10,151
Gas						4,230
Navajo (northern): Oil	1,440	216	104,175			157,477
Osage:						
Oil	46,257	[1] 2,420,692	3,857,742	24,479	[1] 658,912	3,310,200
Gas			1,068,026			865,473
Pawnee:						
Oil	3,189	27,804	72,170	3,391	34,347	152,354
Gas						5,755
Shawnee [2]	3,138	32,717	151,203	3,357	23,446	122,383
Shoshone: Oil			8,653			3,449
Ute: Oil						103
	143,576	2,759,291	9,665,952	197,201	1,622,159	9,327,974

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[1] Includes deferred payments.
[2] Includes Pottawatomie.

STATE TAXES ON CRUDE PETROLEUM

The chapter of this series for 1929 (p. 517) contained a table taken from the Oil Weekly of December 5, 1930, showing the State severance taxes levied on crude petroleum. These taxes remained unchanged throughout 1930; the table is repeated in this chapter.

Oklahoma.—3 per cent of gross value, less royalty interest.

Texas.—2 per cent of gross value.

Louisiana.—From 4 to 11 cents a barrel, depending upon gravity.

Arkansas.—2.6 per cent of gross market value.

Montana.—2 per cent of gross value at well.

Wyoming and New Mexico.—Production based upon State and county assessments.

California.—0.66443 mill per barrel of oil produced and 17.39 cents per acre on proved oil lands.

SUMMARY OF REFINERY STATISTICS

Runs of crude petroleum to stills in 1930 totaled 927,447,000 barrels, a decline of 6.1 per cent from 1929; 1930 marked the first year since statistics were first compiled (1916) that crude runs to stills have decreased.

The production of motor fuel in 1930 amounted to 440,728,000 barrels, a slight gain over the previous year. Because of the decline in runs to stills, this increase in output was due solely to a further gain in yield of gasoline, which rose from 44 per cent in 1929 to 46.6 per cent in 1930. The chief factor in the increase in recovery of gasoline in 1930 was the increased use of cracking equipment. The production of gasoline by cracking in 1930 amounted to 164,443,000 barrels, a gain of 14.4 per cent over the previous year and the equivalent of 38 per cent of the total output as compared with 33 per cent in 1929. Imports of gasoline in 1930 amounted to 16,927,000 barrels, or nearly double those in the previous year. The indicated domestic demand for motor fuel in 1930 totaled 394,800,000 barrels, a new record; however, this quantity represents a gain of only 5 per cent over the previous year as compared with an average annual increase of 14.5 per cent over the past 10 years. Exports of motor fuel increased in 1930, amounting to 65,575,000 barrels as compared with 62,059,000 barrels in 1929. After the first few months of the year, when gasoline stocks rose to record levels, the refiners gave considerable attention to reducing their inventories, with the result that stocks of motor fuel at the end of the year—40,541,000 barrels—were nearly 3,000,000 barrels below the total on hand at the beginning of the year. In spite of this improvement the total was considered too high by approximately 10,000,000 barrels, and plans were made to reduce it further in 1931. Although motor-fuel stocks at the end of 1930 were lower than at the close of 1929, the low point in 1930 was approximately 5,000,000 barrels above the low point in 1929. This fact served to depress the gasoline market at the time of greatest consumption. The trade in kerosene continued to decline in both domestic and foreign markets. Stocks of kerosene were reduced during 1930. Production of gas oil and fuel oil declined materially as a result of the curtailment in crude runs and the increase in cracking. The production of lubricants was practically unchanged, but both the domestic and foreign demand fell off and stocks increased. The trend in the production of wax followed closely that of lubricants, the chief difference being that the decline in wax production was much greater. The production of petroleum coke continued to increase rapidly, and the output in 1930—1,940,000 short tons—was approximately double that in 1926. The output of asphalt declined in 1930.

Refinery statistics, 1926–1930

[Thousands of barrels of 42 U. S. gallons except as otherwise indicated]

	1926	1927	1928	1929	1930
Crude oil run to stills:					
Domestic	734,301	778,729	835,711	912,191	866,615
Foreign	44,963	50,106	77,584	75,517	60,832
	779,264	828,835	913,295	987,708	927,447
Natural gasoline run to stills or blended at refineries [1]	27,696	32,162	35,223	46,457	43,170
Stocks of crude oil (domestic and foreign) at refineries at end of year [2]	35,475	39,317	40,529	46,195	41,136
Motor fuel:					
Produced	302,769	334,049	380,990	439,393	440,728
Imported	5,540	5,002	4,198	8,834	16,927
Exported [3]	43,769	44,951	53,412	62,059	65,575
Domestic demand	264,391	299,818	332,033	375,999	394,800
Stocks at refineries at end of year	39,067	33,349	33,092	43,261	40,541
Kerosene:					
Produced	61,768	56,113	59,353	55,940	49,208
Imported	74	55	202	208	200
Exported [3]	22,248	19,537	22,034	20,022	16,884
Domestic demand	38,140	37,491	36,235	36,032	34,736
Stocks at refineries at end of year	8,575	7,715	9,001	9,095	6,883

[1] Includes natural gasoline run through pipe lines in California.
[2] East of California.
[3] Including shipments to Alaska, Hawaii, and Porto Rico.

Refinery statistics, 1926–1930—Continued

[Thousands of barrels of 42 U. S. gallons except as otherwise indicated]

	1926	1927	1928	1929	1930
Gas oil and fuel oil:					
Produced	365,195	393,066	427,237	448,949	372,498
Imported	14,432	8,124	7,268	20,545	26,080
Exported [3]	38,351	47,391	44,427	39,151	36,450
Domestic demand	(4)	(4)	(4)	(4)	(4)
Stocks at refineries at end of year [2]	24,898	34,022	34,926	34,425	37,007
Lubricants:					
Produced	32,293	31,721	34,658	34,359	34,201
Imported	33	8	13	39	25
Exported [3]	9,435	9,776	11,023	10,860	9,935
Domestic demand	22,568	21,669	23,168	23,609	21,589
Stocks at refineries at end of year	7,576	7,860	8,340	8,269	10,971
Wax (thousands of pounds):					
Produced	645,815	584,347	630,144	630,074	547,680
Stocks at refineries at end of year	185,331	167,214 [5] 150,638	110,344 [6] 112,554	189,592	232,592
Coke (thousands of short tons):					
Produced	995.3	1,145.2	1,426.6	1,820.6	1,940.0
Stocks at refineries at end of year	290.6	345.1	436.9	745.4	1,069.1
Asphalt (thousands of short tons):					
Produced	2,922.8	3,417.7	3,296.8	3,469.2	3,308.0
Stocks at refineries at end of year	193.3	220.8	235.5	240.3	307.8
Shortage	26,928	28,396	29,040	35,064	37,003

[2] East of California.
[3] Including shipments to Alaska, Hawaii, and Porto Rico.
[4] Figures not available.
[5] For comparison with 1928.
[6] For comparison with 1929.

OIL SHALE AND SHALE OIL

Several oil-shale plants in the United States are capable of operation; but, as far as the bureau can ascertain, no shale or shale oil was produced in 1930. The experimental plant of the Bureau of Mines at Rulison, Colo., which has accounted for about all the production in the country in the last few years, was dismantled on June 30, 1929.

The production of oil shale in the seven foreign countries reporting showed a small decline in 1930. Although the output in Scotland in 1930 decreased slightly for the third successive year, that country continued to rank far ahead of the other nations in the oil-shale industry.

World production of oil shale, 1926–1930, in metric tons

[Compiled by M. T. Latus, of the Bureau of Mines]

Country	1926	1927	1928	1929	1930
Australia:					
New South Wales	-----	-----	-----	-----	352
Tasmania	2,161	3,201	2,637	4,368	5,515
Estonia	431,678	397,609	446,117	517,653	497,955
France [1]	69,190	87,500	77,047	78,600	75,469
Germany (Bavaria)	10	480	670	603	544
Great Britain: Scotland	1,991,250	2,080,122	2,070,826	2,056,088	2,052,939
Italy	3,080	4,890	1,560	1,331	1,088
Russia [2]	1,871	9,434	562	(3)	(3)
Spain	(4)	54,337	54,110	54,900	55,147
Sweden [5]	4,781	2,178	-----	-----	(3)
United States	5,500	7,600	1,928	1,767	-----

[1] Includes some boghead coal.
[2] Year ended Sept. 30.
[3] Data not available.
[4] There is in operation in Puertollano a plant for the treatment of oil shale and impure coal to obtain oil but no details of production are available.
[5] Alum shale used for oil.

PROPERTIES OF CRUDE OILS FROM VARIOUS FIELDS OF THE UNITED STATES

An important phase of the work of the Bureau of Mines consists in analyzing crude oils to determine their physical and chemical properties. The first publication summarizing these analyses was Report of Investigations 2202, Properties of Typical Crude Oils from the Eastern Producing Fields of the United States, by E. W. Dean, issued in January, 1921. The bureau has since published one or more analyses of the crude oil from practically every producing field of the world. The analyses of domestic crudes were summarized by the bureau in 1928 in Bulletin 291, Tabulated Analyses of Representative Crude Petroleums of the United States, by N. A. C. Smith and E. C. Lane. They were first summarized in Mineral Resources in the chapter of this series for 1925. The following data were taken from Report of Investigations 3130, Properties of Typical Crude Oils from the East Texas Field, the only such report issued since the chapter on Petroleum was prepared for Mineral Resources, 1929.

Properties of crude oils from various fields of the United States

Sample No.	State	County	Field or district	Producing formation	Depth	Properties of crude			
						A. P. I.	Sulphur content	Viscosity at 100° F.	Pour test, °F.
					Feet	°	P. ct.		
31061	Texas	Van Zandt	Van	Woodbine	2,710	33.4	0.89	56	(1)
31062	do	Smith	Southwest Extension Joiner.	do	3,688	39.4	.30	40	45
31063	do	Rusk	Joiner	do	3,592	38.6	.28	40	25
31064	do	Rusk-Gregg	Kilgore	do	3,652	40.0	.29	40	25
31065	do	Gregg	Longview	do	3,587	38.4	.26	41	30

Sample No.	Gasoline fraction		Kerosene fraction		Viscosity at 100° F. of vacuum fractions			Carbon residue of residuum	Base of crude
	Per cent	A. P. I.	Per cent	A. P. I.	225°–250° C.	250°–275° C.	275°–300° C.		
		°		°				Per cent	
31061	24.6	61.0	16.1	43.6	62	93	175	10.0	Paraffin.
31062	37.1	60.8	9.2	41.7	60	85	150	7.7	Intermediate.
31063	35.8	60.2	9.7	41.7	55	81	130	6.6	Do.
31064	36.0	61.0	9.1	41.7	55	85	140	7.9	Do.
31065	35.0	59.5	10.3	41.9	55	80	130	6.7	Do.

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[1] Below 5° F.